BIOPAK 240 REVOLUTION

BioPak 240R-NIOSH

Closed-Circuit, Self-Contained Breathing Apparatus

Benchman Manual

A47D135, Revision M
B5-06-6000-15-0
ECO 9652 [March 2013]

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Respirator NIOSH Approval Label 4
ExtendAir® CO_2 Scrubber NIOSH Approval Label 5
OrbSorb® CO_2 Scrubber NIOSH Approval Label 5
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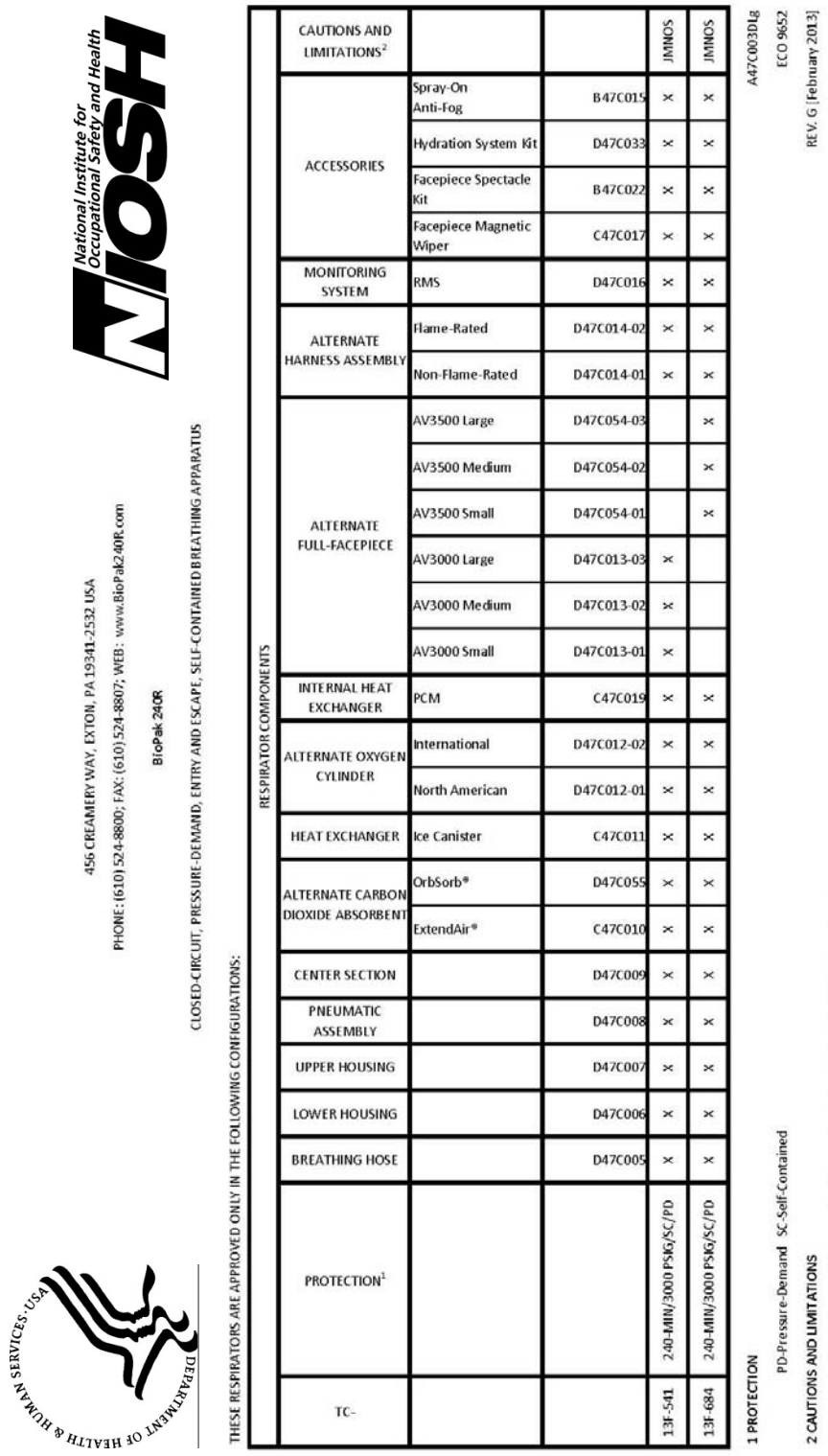
CERTIFICATION APPROVALS

Respirator NIOSH Approval Label:



National Institute for Occupational Safety and Health

456 CREAMERY WAY, EXTON, PA 19341-2532 USA

PHONE: (610) 524-8800; FAX: (610) 524-8807; WEB: www.BioPak240R.com

BioPak 240R

CLOSED-CIRCUIT, PRESSURE-DEMAND, ENTRY AND ESCAPE, SELF-CONTAINED BREATHING APPARATUS

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:

	RESPIRATOR COMPONENTS					
	CAUTIONS AND LIMITATIONS[2]			JMNOS	JMNOS
	ACCESSORIES	Spray-On Anti-Fog	B47C015	X	X
		Hydration System Kit	D47C033	X	X
		Facepiece Spectacle Kit	B47C022	X	X
		Facepiece Magnetic Wiper	C47C017	X	X
	MONITORING SYSTEM	RMS	D47C016	X	X
	ALTERNATE HARNESS ASSEMBLY	Flame-Rated	D47C014-02	X	X
		Non-Flame-Rated	D47C014-01	X	X
	ALTERNATE FULL-FACEPIECE	AV3500 Large	D47C054-03		X
		AV3500 Medium	D47C054-02		X
		AV3500 Small	D47C054-01		X
		AV3000 Large	D47C013-03	X	
		AV3000 Medium	D47C013-02	X	
		AV3000 Small	D47C013-01	X	
	INTERNAL HEAT EXCHANGER	PCM	C47C019	X	X
	ALTERNATE OXYGEN CYLINDER	International	D47C012-02	X	X
		North American	D47C012-01	X	X
	HEAT EXCHANGER	Ice Canister	C47C011	X	X
	ALTERNATE CARBON DIOXIDE ABSORBENT	OrbSorb®	D47C055	X	X
		ExtendAir®	C47C010	X	X
	CENTER SECTION		D47C009	X	X
	PNEUMATIC ASSEMBLY		D47C008	X	X
	UPPER HOUSING		D47C007	X	X
	LOWER HOUSING		D47C006	X	X
	BREATHING HOSE		D47C005	X	X
	PROTECTION[1]				
TC-				13F-541	240-MIN/3000 PSIG/SC/PD	13F-684	240-MIN/3000 PSIG/SC/PD

A47C003DLg

ECO 9652

REV. G [February 2013]

1 PROTECTION

PD-Pressure-Demand SC-Self-Contained

2 CAUTIONS AND LIMITATIONS

J-Failure to properly use and maintain this product could result in injury or death.

M-All approved respirators shall be selected, fitted, used and maintained in accordance with MSHA, OSHA and other applicable regulations.

N-Never substitute, modify, add or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.

O-Refer to User's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

S-Special or critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning.

DEPARTMENT OF HEALTH & HUMAN SERVICES, USA

ExtendAir® Carbon Dioxide Chemical Scrubber NIOSH Approval Label:

BIOMARINE INCORPORATED
456 CREAMERY WAY, EXTON, PA 19341-2532 USA
PHONE: (610) 524-8800

CLEAN AIR SCRUBBER

CHEMICAL SCRUBBER CANISTER

TC-13F-541 and TC-13F-684

CAUTIONS AND LIMITATIONS

1. Approved for use only in replacing or refilling chemical scrubber part number C47C010.
2. Not approved for use after indicated expiration date.
3. Do not re-use scrubber materials.

A47C024DLd
REV. D [12/07/2011]

OrbSorb® Carbon Dioxide Chemical Scrubber NIOSH Approval Label:

BIOMARINE INCORPORATED
456 CREAMERY WAY, EXTON, PA 19341-2532 USA
PHONE: (610) 524-8800

CLEAN AIR SCRUBBER

CHEMICAL SCRUBBER CANISTER

TC-13F-541 and TC-13F-684

CAUTIONS AND LIMITATIONS

1. Approved for use only in replacing or refilling chemical scrubber part number D47C055.
2. Not approved for use after indicated expiration date.
3. Do not re-use scrubber materials.

A47C077DLb
REV. B [12/07/2011]

Remote Monitoring System (RMS) MSHA Electrical Approval:

BIOMARINE - NTRON, INC.
456 Creamery Way, Exton, PA 19341 USA

Model: RMS
Permissible Pressure and Temperature Monitoring Device

United States Department of Labor
MSHA
Mine Safety and Health Adminstration

MSHA Approval No: 18-A060028-0
Tested for intrinsic safety in methane-air mixtures only.

Warnings:
The battery is to be changed in fresh air only.
MSHA approved for use with one of the following 9-Volt batteries only:
- Eveready, Inc. Energizer # 522
- Panasonic Industrial Co. # 6AM6
- Rayovac Corp. # A1604
- or Duracell, Inc. # MN1604

The connectors can only be connected to Biomarine BP240R Breathing Apparatus.

CAUTIONS AND LIMITATIONS

J - Failure to properly use and maintain this product could result in injury or death.

M - All approved respirators shall be selected, fitted, and maintained in accordance with NIOSH, MSHA, OSHA, and other applicable regulations.

N - Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by Biomarine.

O - Refer to User's instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

S - Special or Critical User's Instructions and/or specific use limitations apply. Refer to User's instructions before donning.

S-SPECIAL OR CRITICAL USER'S INSTRUCTIONS

Please Read Carefully and Fully Understand

- All users of the Self-Contained Breathing Apparatus (SCBA) must be trained by Biomarine Qualified Instructors in the donning, operation, inspection and emergency use procedures of the BioPak 240R.
- Biomarine, or a qualified Biomarine representative, must perform all repairs beyond the scope of this or the BioPak 240R Benchman manual.
- Prior to using the BioPak 240R it must be determined that the user is medically fit. The following lists some, but not all, medical and psychological conditions that could limit or prevent the use of the BioPak 240R.

Emphysema	Chronic Obstructive Pulmonary Disease
Bronchial Asthma	X-Ray evidence of Pneumonia
Evidence of reduce pulmonary function	Coronary Artery Disease
Severe or progressive hypertension	Epilepsy-Grand Mal or Petit Mal
Pernicious Anemia	Diabetes-Insidious or Mellitus
Breathing difficulties when wearing a SCBA	Abnormal or ruptured ear drum
Claustrophobia or anxiety when wearing a SCBA	Pacemaker or other Cardiac Conditions

- ***Compressed Oxygen Hazard:*** Always handle oxygen cylinders with care to prevent damage. Do not allow oil, grease or other foreign materials to come in contact with cylinder, cylinder valve or cylinder pressure regulator to prevent possible ignition. Do not open the cylinder valve in the presence of open flame, sparks or high radiant heat. Failure to follow these recommendations could result in personal injury or death.
- ***Oxidizing Agent Hazard:*** Oxygen will enhance the combustion of other materials so that materials that normally will not burn in air may burn in oxygen-rich atmospheres; and, materials that do burn in air will burn more vigorously and at a higher temperature in oxygen-rich atmospheres. Oxygen will not cause materials to ignite without the presence of an ignition source.
- ***Work Load Stress Factors:*** The use of a SCBA will add to the work load and stress of the user. The user must be capable of determining when excessive ambient temperatures and high workloads will lead to physical exhaustion and/or collapse.
- ***Low Temperature Operation:*** The BioPak 240R is suitable for respiratory protection during entry into and escape from oxygen deficient atmospheres in temperature as low as -5^{o}F (-20^{o}C) **providing:** 1) If the BioPak is stored in low temperatures it must be fully dry and NOT have the carbon dioxide scrubber pre-packed into the breathing chamber; and 2) the carbon dioxide scrubber is stored at temperatures above 32^{o}F (0^{o}C) and is only installed into

the BioPak just prior to use. Prior to donning a cold BioPak, verify that the cylinder is securely connected to the pressure regulator.

- The BioPak 240R is approved only with the oxygen cylinder is fully charged with compressed medical or aviation grade oxygen with moisture content less than 50 mg/m^3 at 3000 psi (207 bar). Allow the oxygen cylinder to cool after filling to determine the correct pressure. **Do not substitute any other gas type for the specified oxygen. The user bears full responsibility for the purity of oxygen contained in the BioPak 240R oxygen cylinder. The use of non-approved gasses can result in injury or death. If the oxygen cylinder is improperly filled with any gas other than oxygen, the cylinder must be replaced. A foreign gas may cause cylinder corrosion.**
- Always check the BioPak 240R oxygen cylinder for a current hydrostatic test date. DOT requires carbon fiber wrapped, aluminum cylinders be tested by an approved facility on a 5-year cycle from the date of manufacture. Cylinder inspections by the user as outlined in CGA 6.2 must be done on a regular basis.
- Prior to each use of the BioPak 240R, a fully charged oxygen cylinder, a fresh charge of carbon dioxide absorbent, frozen ice canisters, moisture control sponges and the phase change module (PCM) must be installed.
- After each use of the BioPak 240R, a thorough cleaning and disinfection of the facemask, breathing hoses and breathing loop must be completed in accordance with procedures provided in the BioPak 240R Benchman manual.
- Use with adequate skin protection when worn in atmospheres that contain gases or vapors that poison by skin absorption (for example hydrocyanic acid gas).
- Do not use an unapproved facemask. Use only the facemasks approved for the BioPak 240R. An unapproved facemask will compromise the protection provided to the user by the BioPak 240R. A good facemask seal is important to achieving full protection and duration. Users should conform to MSHA/NIOSH guidelines concerning facial hair and use of the facemasks. A clean-shaven user will significantly increase the chances of achieving an adequate face seal.
- The on-going effectiveness and reliability of any protective breathing equipment is dependent upon the user/owner's standard of care in maintaining the equipment and the user's expertise in using the equipment.
- Personnel who intend to use protective breathing equipment in a dangerous atmosphere must have the proper training, temperament and experience to be able to function safely.
- The user shall periodically inspect the TRIM display as described in this manual to determine the status of the respirator oxygen supply.
- ***Intrinsic Safety Consideration for Model/Type RMS permissible Pressure and temperature Monitoring Device:***
    - Read manual before use.
    - The connectors of the monitoring device may only be connected to a Biomarine BioPak 240R Breathing Apparatus oxygen regulator, manifold block and breathing chamber. The fiber optic cable may only be connected to the BioPak 240R remote gauge assembly.
    - Tested for intrinsic safety in methane-air mixtures only.
    - The battery is to be changed in fresh air only. Do not change battery in hazardous areas. Approved for use only with the battery types specified in this manual.

- The use of the OrbSorb® carbon dioxide chemical scrubbers **must always** include the installation of the moisture pad provided with the scrubber. Failure to install the moisture pad as described in this manual can lead to scrubber flooding and elevated inhalation concentrations of carbon dioxide that may lead to injury or death.

DISCLAIMER

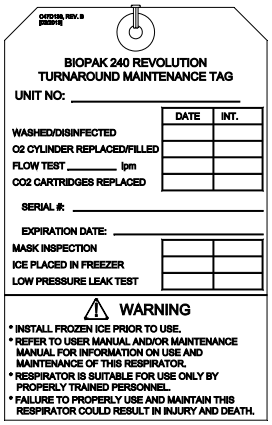
This manual presents the minimum recommended procedures for maintaining the BioPak 240R. End users are free to implement additional procedures and tests above and beyond the scope of this manual as they see fit or as may be required for specific locations or applications, provided these procedures meet all criteria presented in the manual.

Failure to follow the minimum procedures presented in this manual may violate government or agency approvals as well as void the manufacturer's warranty.

Contact Biomarine with any questions pertaining to customized procedures or questions concerning the procedures stipulated in this manual.

1. TURN AROUND MAINTENANCE PROCEDURE

1.1 Maintenance Tag


BIOPAK 240 REVOLUTION
TURNAROUND MAINTENANCE TAG
UNIT NO:
DATE
INT.
WASHED/DISINFECTED
O2 CYLINDER REPLACED/FILLED
FLOW TEST _____ lpm
CO2 CARTRIDGES REPLACED
SERIAL #:
EXPIRATION DATE:
MASK INSPECTION
ICE PLACED IN FREEZER
LOW PRESSURE LEAK TEST
WARNING
* INSTALL FROZEN ICE PRIOR TO USE.
* REFER TO USER MANUAL AND/OR MAINTENANCE MANUAL FOR INFORMATION ON USE AND MAINTENANCE OF THIS RESPIRATOR.
* RESPIRATOR IS SUITABLE FOR USE ONLY BY PROPERLY TRAINED PERSONNEL.
* FAILURE TO PROPERLY USE AND MAINTAIN THIS RESPIRATOR COULD RESULT IN INJURY AND DEATH.

Obtain a maintenance tag supplied with replacement carbon dioxide scrubbers.

The maintenance tag shall be completed as directed in this procedure and then attached to the apparatus in a prominent location to show completion of all maintenance steps.

Record the apparatus identification onto the tag.

1.2 Disassembly

Immediately after completion of BioPak use, remove the used CO2 scrubber canisters, scrubber moisture pad and disconnect the demand and constant add lines to the center section to prevent migration of moisture into the manifold assembly.

Disassemble the apparatus to prepare for cleaning and disinfection. Identify any apparatus damage and repair as needed. Repairs beyond the scope of the Benchman should be referred to **Biomarine.**

1. Remove the upper housing.
2. Remove the coolant lids and coolant ice.
3. Remove the oxygen cylinder, making sure the seal washer remains in place, and install the regulator wash cover supplied with the service kit.

It is acceptable to leave the oxygen cylinder in place until after washing and disinfecting has been completed to prevent ingress of contaminates into the high pressure plumbing of the BioPak.

4. Remove the facemask from the breathing hoses.
5. Remove the breathing hoses from the breathing chamber.
6. Remove the center section lid.
7. Remove and discard the two carbon dioxide scrubber components and the scrubber moisture pad.
8. Remove the moisture sponges and the PCM.
9. Disconnect the electrical line and both pneumatic connections to the center section. Use care when handling the center section. Avoid sharp objects and rough surfaces that could damage the rubber diaphragm.
10. Remove the four quarter-turn fasteners and remove the center section.

1.3 Cleaning/Disinfection

Use only cleaners and disinfectants that are approved by **Biomarine.**

The apparatus must be cleaned and disinfected as soon as possible after each use. If cleaning is not immediately possible after use, at a minimum remove and discard the carbon dioxide scrubber and moisture pad, remove the moisture control foam pads and temporarily store the BioPak with the center section lid open to prevent the growth of mold or mildew.

DO NOT submerge the electronic monitor housing.

DO NOT allow any fluids to contact the input port of the pressure regulator.

1. Clean the upper and lower housings, ice canisters and coolant lids and all connected components with a mild soap and water mixture if necessary.
2. Mix the disinfectant with clean water as directed on the package.
3. Submerge the facemask, hoses with facemask connector, center section lid, center section, PCM and moisture sponges into the disinfectant solution. Allow the components to be wetted on all surfaces for a minimum of 10-minutes.

Install a Demand Port Wash Plug, supplied with the service kit, to the demand port of the center section to keep water from migrating into the demand housing.

Do NOT allow the mask to soak in cleaning solutions for extended periods. Extended soaking can cause delamination of the anti-fog film.

4. **Thoroughly** rinse all components in clean water to remove all disinfection solution. **It is extremely important to fully rinse the facemask of all cleaning solution.**
5. Allow all components to dry either by air-drying, heated drying or through the use a dryer system. Heat assisted drying temperatures shall not exceed 120°F (50°C).
6. Date and initial the maintenance tag under *Washed/Disinfected.*

1.4 Coolant Canister

The coolant canisters must be frozen before use.

1. Place the cleaned and dried canisters into the freeze form and tighten the nuts securely.
2. Place the freeze forms onto a level surface in a freezer for a minimum 8-hour period at a temperature of 10°F (-12°C) or less.
3. Date and initial the maintenance tag under *Ice Placed in Freezer.*

1.5 Oxygen Cylinder

The oxygen cylinder must be fully charged to 3000 psi (207 bar) with oxygen before use.

Oxygen used to supply or charge the breathing apparatus must be medical or aviation grade oxygen with moisture content less than 50 mg/m^3 at 3000 psi (207 bar). The composition of suitable oxygen is given below.

Oxygen: 99.5% minimum mole
Carbon Dioxide: 300 ppm maximum
Carbon Monoxide: 10 ppm maximum

The purity/quality of oxygen used to supply and charge breathing apparatus should be tested periodically in accordance with national regulations.

National regulations must be observed.

Oxygen will enhance the combustion of other materials. Personnel dealing with compressed oxygen and compressed oxygen cylinders must be fully trained in the use and handling of compressed oxygen.

1. Obtain the proper cylinder fill adapter needed to connect the oxygen cylinder to the booster pump.
2. Connect the cylinder to the booster pump and charge to 3000 psi (207 bar) pressure with medical or aviation grade oxygen, according to pump manufacturer's instructions.

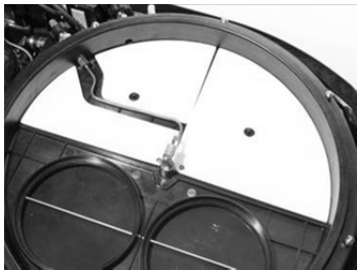
1.6 Facemask

1. Inspect the components of the facemask and replace as required.
2. **Do not** apply anti-fog solutions of any kind to the lens of the facemask.
3. Date and initial the maintenance tag under *Mask Inspection.*

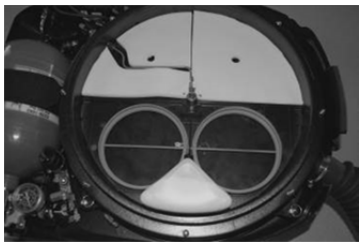
1.7 Assembly

1. Position the BioPak in a level position, as depicted above, by propping up the handle end of the lower housing.

2. Install the center section making sure to properly seat the three springs onto the diaphragm.
3. Lock the center section into position using the four quarter-turn fasteners.
4. Connect the electrical and pneumatic lines to the center section. Verify the presence of an o-ring seal on each pneumatic line connection.
5. Position the fully dry moisture sponges into the center section. The sponges must be fully dry to prevent the growth of mold within the apparatus.



6. Install the PCM into the breathing chamber.



7. Install the center section lid and latch to secure. If pre-packing the carbon dioxide scrubbers complete section 1.12 then return to step 7 of this section.
8. Install the breathing hoses to the breathing chamber and secure with clamps making sure mask connector is sitting flat and the flow direction arrows of the connector are facing up.
9. Install the storage plug into the facemask connector.
10. Install the oxygen cylinder and secure with the hold down strap.

1.8 Constant Flow Test

1. Disconnect the constant add feed line to the center section (smaller of the two pneumatic connections) and connect the test flowmeter from the service kit to the open end of the feed line.

2. Open the oxygen cylinder valve and observe flowmeter while holding it in a vertical and level position. The flowmeter shall indicate a flow as per the table below when reading the center of the flowmeter ball. The table provides flow readings for elevations of sea level to 5280 feet (1600 meters) and above 5280 feet (1600 meters).

If the flow does not meet the requirements of the table below, the flow restrictor will need replacement.

Cylinder Pressure, psi	**Flow 0-5280 ft, lpm**	**Flow + 5280 ft, lpm**
1500-2000	1.8-2.4	1.9-2.6
2000-3000	1.9-2.5	2.0-2.8
Cylinder Pressure, bar	**Flow 0-1600m, lpm**	**Flow + 1600m, lpm**
100-150	1.8-2.4	1.9-2.6
150-207	1.9-2.5	2.0-2.8

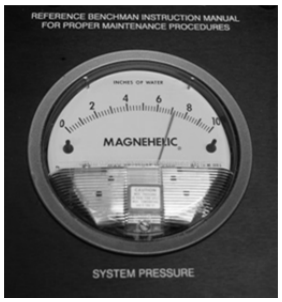
3. Enter the measured flow rate, date and initial the maintenance tag under *Flow Test____ lpm.*
4. Close the oxygen cylinder valve, remove the test flowmeter and reconnect the constant add feed line to the center section.

1.9 Low Pressure Leak Test

1. Remove the storage plug from the breathing hoses and install the leak test adapter from the service kit.

2. Attach rubber tubing from the service kit between the leak test adapter and the input port of the service kit.

3. Insert two test keys from the service kit in the keyholes in the back of the lower housing.
4. Open the oxygen cylinder valve and depress the bypass valve until the test kit displays a pressure of 3.0” water column, then immediately close the oxygen cylinder valve.



5. Activate the emergency bypass valve to empty all gas into the breathing chamber and raise the pressure reading to between 6 and 8” water column. **DO NOT** over pressurize.
6. After the test gauge stabilizes, note the exact pressure reading of the service kit and allow the apparatus to sit undisturbed for 60-seconds. The apparatus pressure shall not drop more than 0.2” water column in the 60-second period.

If the oxygen cylinder is not closed the pressure reading will continue to rise and potentially damage the breathing chamber.

If the apparatus pressure drops more than 0.2” in the 60-second there is a leak that must be located and repaired.

7. Open the service kit bleed valve.
8. Remove the leak test adapter to vent the apparatus.
9. Replace the storage plug.
10. **Remove the two test keys from the rear of the lower housing.**
11. Date and initial the maintenance tag under *Low Pressure Leak Test.*

1.10 Alarm Test

1. While observing the pressure gauge and TRIM indicator, open the oxygen cylinder valve. The cylinder must be filled with a minimum of 1500 psi (100 bar) pressure for this test.
2. When the oxygen cylinder is opened the TRIM indicator shall cycle **Red, GREEN, BLUE** with the horn sounding. The TRIM will then flash **GREEN** and the horn will be silent.
3. The pressure gauge will reach full reading in approximately 60-seconds.
4. Close the oxygen cylinder and allow the BioPak to slowly reduce pressure while observing the pressure gauge and LED indications. The LED indication should turn to a flashing red with a horn sounding when the pressure gauge reads between 650-1000 psi (45-69 bar). The LED indication will cease when the pressure gauge reads less than 25 psi (1.7 bar).
5. Verify that the oxygen cylinder is fully charged to 3000 psi (207 bar) and top off if necessary.
6. Date and initial the maintenance tag under *O2 Cylinder Replaced/Filled.*

1.11 Upper Housing

1. Replace the upper housing onto the apparatus.
2. If the carbon dioxide scrubbers have not been installed into the apparatus then leave the maintenance tag *CO2 Cartridges Replaced* field blank.

See section 1.12 concerning procedures for pre-packing the carbon dioxide scrubber into the apparatus during turn around maintenance.

3. Tie the completed maintenance tag to the BioPak in a conspicuous and consistent location.

1.12 Carbon Dioxide Scrubber Pre-Packing Procedure

Pre-packing the BioPak 240R with the carbon dioxide scrubbers is only permitted when utilizing OrbSorb® carbon dioxide scrubber.

The OrbSorb® carbon dioxide scrubbers can be pre-packed into the apparatus during turn around maintenance if so desired.

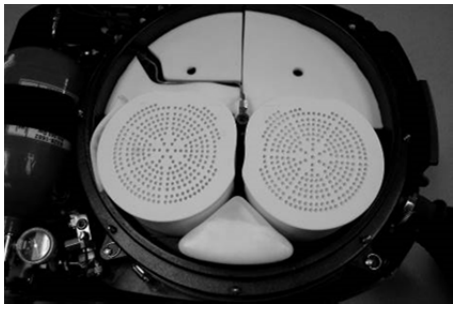
Pre-packed carbon dioxide scrubbers may only be stored in the apparatus for a maximum period of 1-year.

Moisture sponges must be installed dry when pre-packing the BioPak.

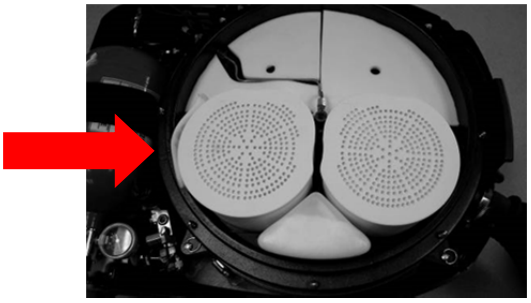
DO NOT pre-pack any BioPak that will be stored at temperatures at or below freezing (32°F/0°C).

Apparatus that are pre-packed with the carbon dioxide scrubber shall be stored within the specified storage temperature and humidity levels and must be sealed air-tight in the apparatus.

1. Inspect the expiration date of the carbon dioxide scrubber to ensure that it is not expired. Record the carbon dioxide scrubber serial number and expiration date onto the maintenance tag or affix the scrubber label to the back of the tag.
2. Verify that each carbon dioxide scrubber canister has an o-ring installed.
3. Install two carbon dioxide scrubber canisters into the breathing chamber making sure that they are proper aligned and fully seated into position. Proper alignment of the scrubbers will have the canister arrows directed at the center point of the center section.



4. Install the moisture pad supplied with the canister into the center section as depicted below.



WARNING: Failure to install the moisture pad will result in scrubber flooding and caused elevated carbon dioxide levels in the inhalation gas that could lead to injury or death.

5. Install and secure the breathing chamber lid.
6. Date and initial the maintenance tag under *CO2 Cartridges Replaced. Record the expiration date of the scrubber onto the maintenance tag.*

The expiration date of pre-packed carbon dioxide scrubbers will be the shorter time period between the following two factors:

1-year from date of scrubber installation into BioPak, or,

"Use By" date provided on packaging of carbon dioxide scrubber.

2 Long Term Maintenance Procedure

In addition to normal turn around maintenance, the apparatus shall be visually inspected and pressure tested on a monthly basis, if the apparatus is being used at least once per month; or, quarterly, if the apparatus is used less than once per month or is in long term storage.

BioPaks that have been placed in long term storage should have the Long Term Maintenance Procedure conducted every 6-months.

A Maintenance Log Sheet is provided in this manual to assist in tracking long-term maintenance procedures.

2.1 Visual Inspection

Remove the upper housing and visually inspect the apparatus for signs of wear, abuse, loose connections or other damage. Repair as necessary.

Verify that the apparatus is properly sealed against the ambient environment by the presence of the storage plug.

2.2 Demand Valve Functional Test

1. Vent the BioPak of all internal pressure.
2. Open the oxygen cylinder and listen for the sound of gas escaping into the breathing chamber. The sound will last approximately 1-3 seconds. This signals that the demand has properly opened.
3. After 1-3 seconds the sound of gas escaping into the breathing chamber must cease. This signals that the demand valve has properly closed.

2.3 Constant Flow Test

1. Perform the test as described in Section 1.8.

2.4 Vent Valve Functional Test

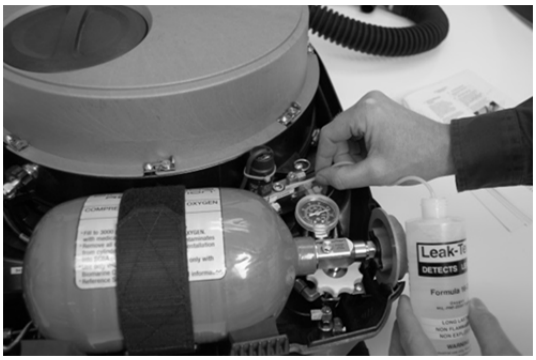
1. Replace the seal plug from the facepiece adapter with the leak test adapter from the test kit and connect the barb of the adapter to the barb of the service kit using rubbing tubing.
2. Fill the apparatus by depressing the emergency bypass valve in several short burst. Observe the pressure reading on the service kit. The apparatus pressure should remain at or below 2” water column pressure after releasing the emergency bypass valve.

2.5 Low Pressure Leak Test

1. Perform the test as described in Section 1.9.

2.6 High Pressure Leak Test

1. Place the apparatus on a flat surface. Ensure that the test keys of the Low Pressure Leak Test have been removed. **The oxygen cylinder must be fully charged to above 1500 psi (103 bar).**
2. Open the oxygen cylinder valve and wait until the apparatus pressure gauge has reached its final reading.



3. Inspect each plumbing connection with oxygen safe leak detection fluid by wetting each joint, waiting 60-seconds, then inspecting each joint for the sign of bubble formation. The presence of bubbles will indicate a leak.
4. Repair any leaking joint or replace the leaking components. **Repairs must be performed with the BioPak fully vented of all internal pressure.**
5. Close the oxygen cylinder valve and depress the emergency vent valve to depressurize the apparatus.

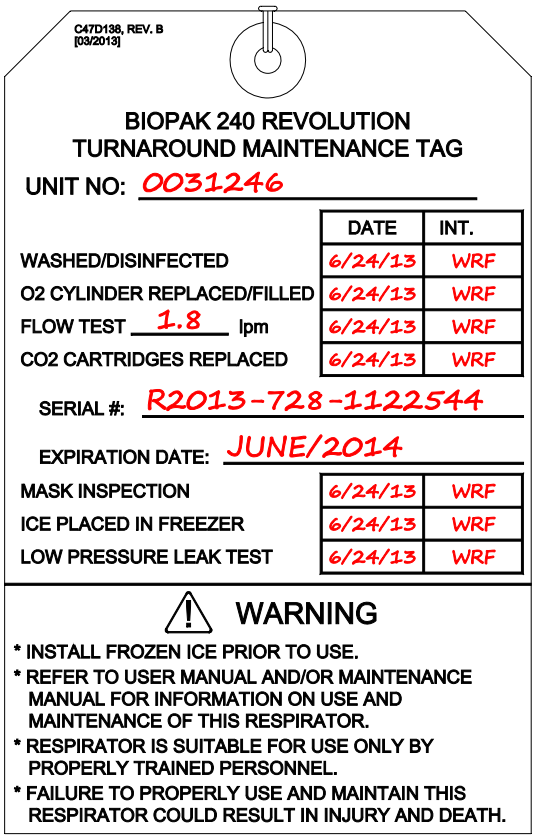
2.7 Emergency Bypass Valve Functional Test

1. Open the oxygen cylinder and depress the emergency bypass valve for 1-2 seconds. The sound of gas escaping into the breathing shall be heard whenever the valve is depressed and shall cease whenever the valve is released.
2. Close the oxygen cylinder.

2.8 Alarm Test

1. Perform the test as described in Section 1.10.

2.9 Maintenance Tag Validation


C47D138, REV. B
[03/2013]

BIOPAK 240 REVOLUTION
TURNAROUND MAINTENANCE TAG

UNIT NO: 0031246

	DATE	INT.
WASHED/DISINFECTED	6/24/13	WRF
O2 CYLINDER REPLACED/FILLED	6/24/13	WRF
FLOW TEST 1.8 lpm	6/24/13	WRF
CO2 CARTRIDGES REPLACED	6/24/13	WRF

SERIAL #: R2013-728-1122544

EXPIRATION DATE: JUNE/2014

MASK INSPECTION	6/24/13	WRF
ICE PLACED IN FREEZER	6/24/13	WRF
LOW PRESSURE LEAK TEST	6/24/13	WRF

WARNING

* INSTALL FROZEN ICE PRIOR TO USE.
* REFER TO USER MANUAL AND/OR MAINTENANCE MANUAL FOR INFORMATION ON USE AND MAINTENANCE OF THIS RESPIRATOR.
* RESPIRATOR IS SUITABLE FOR USE ONLY BY PROPERLY TRAINED PERSONNEL.
* FAILURE TO PROPERLY USE AND MAINTAIN THIS RESPIRATOR COULD RESULT IN INJURY AND DEATH.

1. Inspect the maintenance tag that should be attached to the apparatus in a conspicuous and consistent location. Verify that all portions of the tag are properly completed.
2. Verify that the apparatus oxygen cylinder is fully charged to 3000 psi (207 bar) and top off if necessary.
3. Replace the upper housing.

3. General Service Procedures

3.1 Scheduled Component Inspection

Breathing Diaphragm:

Annually, remove the center section and disconnect the diaphragm from the center section by loosening the clamp. Inspect the diaphragm for signs of wear, cracking or rot. Disassemble the vent valve, clean and inspect all components and lubricate as needed. Reference the parts list for proper diaphragm alignment.

Diaphragm Alignment: Proper diaphragm alignment is depicted below. Note the positioning of the three large holes in the diaphragm plate in relation to the breathing chamber mounting feet and the breathing hoses. Reference diagram in Section 5.8.

Facemask: Inspect all rubber components for signs of wear, tears, rips, cracking or rot.

Breathing Hoses: Inspect for signs of wear, tears, rips, cracking or rot.

O-ring Seals: If the apparatus has passed the high and low pressure leak tests the o-ring integrity is acceptable. It is recommended to perform full system lubrication on an **annual** basis. Otherwise inspect o-rings at intervals of:

O-Ring Description	Uses or Age
Center Section	25 uses annually
Vent Valve	50 uses annually
Other	annually

3.2 System Lubrication

Leaks discovered during high and low pressure testing are often caused by damaged or improperly lubricated o-rings. Replace faulty o-rings and follow the guides below for o-ring handling and lubrication.

- Never pry o-rings from glands with a screwdriver. Remove o-rings by hand or using the pick tool provided in the service kit.
- Unless otherwise directed, do not lubricate o-rings while they are still seated within their gland.
- Do not use heavy coats of lubrication. Proper o-ring lubrication will result in a shiny surface without lumps.
- Do not stretch or deform o-rings during handling.
- Visually inspect under bright lighting and inspect by feel, o-rings for signs of damage such as nicks, cuts, tears or abrasion.
- Christo-Lube™ and Dow 111™ are the only lubricants approved for use in the apparatus.
- **NEVER** lubricate the sealing washer that sits between the oxygen cylinder and the pressure regulator.

3.3 Oxygen Cylinder

The cylinder should be inspected regularly for signs of damage to the outer wrapping. Cylinders that are cracked, flaking or show exposed fibres should be immediately retired from service.

Cylinders will require periodic hydro-static testing per national requirements. Typical intervals are every 5-years from the date of

manufacture. Cylinder testing should be conducted by an authorized testing facility.

Cylinders that have been hydro-static tested shall be cleaned for high-pressure oxygen service as per national standards.

Cylinders are to be retired from service 15-years after the date of manufacture.

3.4. Alarm Battery Replacement Procedure

The alarm system battery shall be replaced after 200-hours of use, after 6-months or after the alarm system low battery alarm (**RED, GREEN, BLUE** flashes with corresponding horn sounding), whichever occurs first.

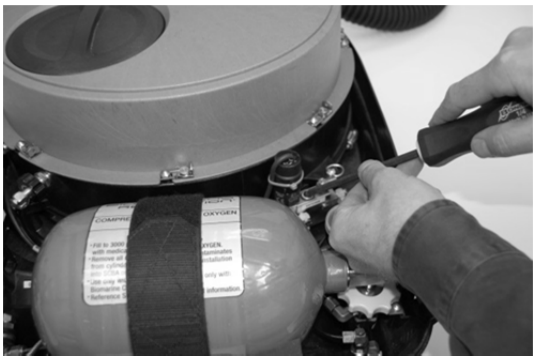
1. Remove the upper cover.
2. Disconnect the electrical line to the center section.
3. Use two 7/16” wrenches from the service kit to remove the light guide from the alarm monitor housing. **DO NOT** allow the fitting anchored to the alarm housing to rotate.
4. Remove the alarm housing from the apparatus. Inspect the housing for cracks or damage. Dust-tight and water-tight integrity are required for use in potentially explosive atmospheres. **The alarm module will require replacement if any damage to the housing is discovered.**
5. Remove the battery cover. Inspect the cover and gasket for cracks or damage. **The battery cover door will need to be replaced if any damage is found.**
6. Remove the battery from the alarm housing and replace with a fresh battery. Inspect the interior of the battery compartment for the presence of corrosion, liquid or dust. Clean if necessary or replace the alarm module.

Use only battery types as specified for replacement.

7. Replace the battery cover making sure that the gasket is properly positioned and that the gasket is not damaged in any way. The battery door will only fit in one orientation on the module.
8. Install the alarm housing into the apparatus.
9. Use two 7/16” wrenches from the service kit to install the light guide from the alarm monitor housing. **DO NOT** allow the fitting anchored to the alarm housing to rotate. The light guide shall be positioned so that it is directed straight down towards the lower housing.
10. Connect the electrical line from the center section to the alarm housing.
11. Conduct the Alarm Test as described in section 3.10.
12. Install the upper housing.

3.5 Flow Restrictor Replacement Procedure

1. Remove the upper housing and vent the BioPak of all internal pressure.



2. Use the ¼” hex driver from the service kit to the remove the flow restrictor. **Be sure to remove and discard the existing head gasket of the existing flow restrictor.**
3. Use the ¼” hex driver from the service kit to the install a replacement flow restrictor.

Use caution when installing the flow restrictor to insure that o-ring does not roll out of its gland.

4. Perform the high-pressure leak test as directed in long term maintenance.
5. Perform the constant add test as directed in turn around maintenance.
6. Replace the upper housing.

3.6 Factory Service and Training

Factory service and personnel User and/or Benchman Training can be provided by contacting the location listed below or by contacting your local Biomarine Dealer or Distributor.

The BioPak 240R-NIOSH User and Benchman manuals can be supplied in electronic format upon request.

Biomarine, Inc.
ATTN: Service Department
456 Creamery Way
Exton, PA 19341-2532
USA

Tel: (610) 524-8800
Extensions 146 or 163

Fax: (610) 524-8807

Web: www.BioPak240r.com

Contact **Biomarine** prior to returning any equipment.

To better serve your needs, please provide the following information when contacting **Biomarine**.

- Apparatus Model Number (240R, 240S, 240 LW, etc.)
- Apparatus Serial Number (Located internal to the BioPak, beneath the oxygen cylinder)
- Date of purchase
- Approximate number of uses
- Description of problem
- Actions taken to correct problem
- Contact name, address and phone number with area or country code and email address
- **Please** provide your current email address with all service correspondence.

4. STORAGE GUIDELINES

Follow the guidelines below for proper storage of the apparatus.

- Storage plug shall be installed.
- Never store a wet apparatus. The apparatus shall be fully dry before storage.
- Never store an apparatus that has not been fully cleaned and disinfected.
- Store in a location free from impact that could cause damage to the apparatus.
- Store in the stated conditions of ambient temperature, relative humidity and air pressure.
- Store in a location that will not submerge the apparatus.
- Do not store the apparatus pre-packed with the ExtendAir® carbon dioxide scrubber canisters.
- **Long Term Storage (storage of BioPak for periods exceeding 6-months without use):** Follow all of the above guidelines. The BioPak should not be placed back into service until all the procedures associated with Turn Around and Long Term maintenance have been performed and passed.

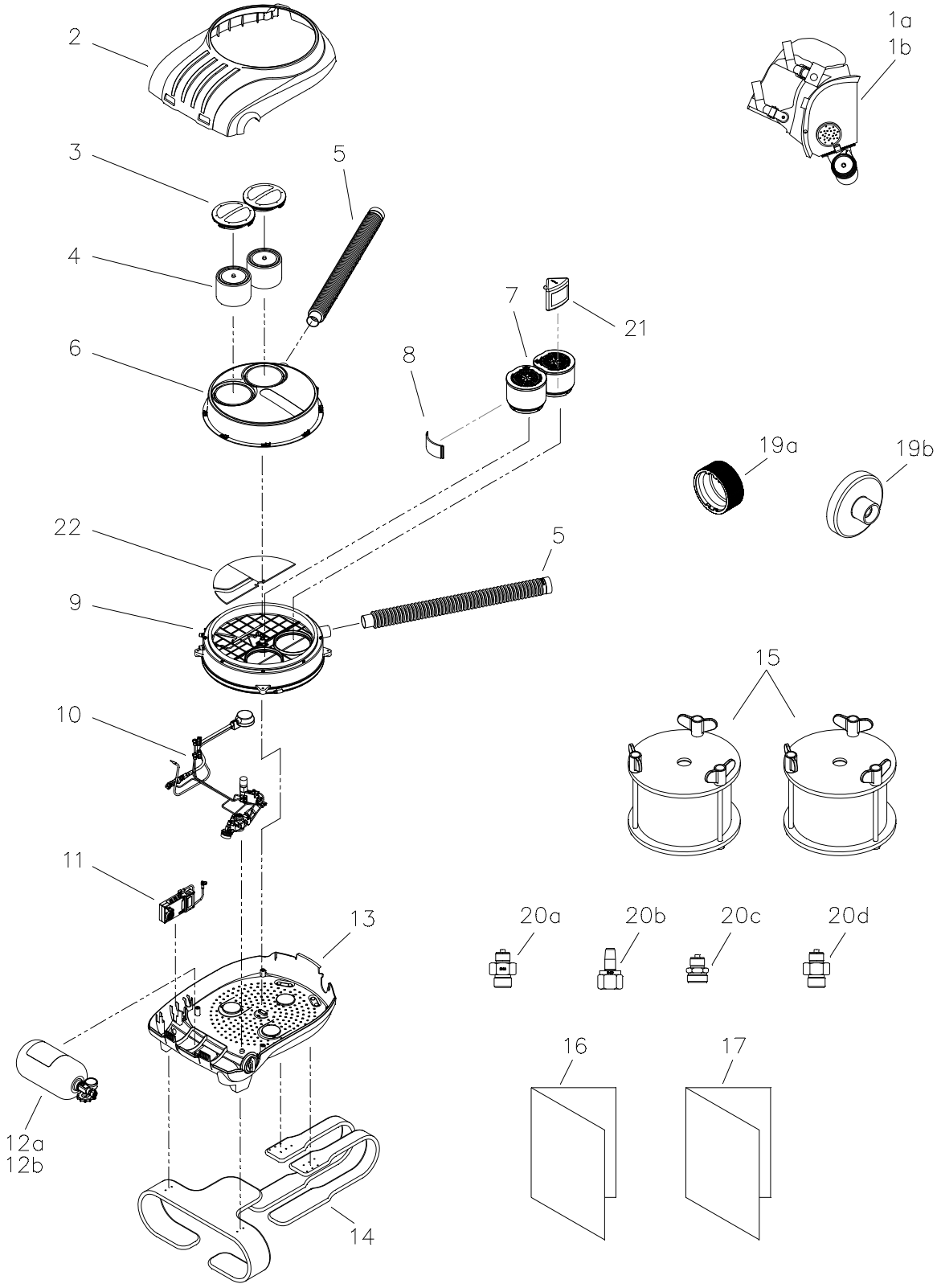
5. PARTS LIST

5.1 Top Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
1a	1	---	AV3000 Facemask Assembly-*See Section 5.2*
1b	1	---	AV3500 Facemask Assembly-*See Section 5.3*
2	1	B6-02-5002-18-0	Upper Housing Assembly
3	2	B2-02-4000-39-0	Coolant Lid
4	2	B6-02-5002-37-0	Ice Canister
5	2	B2-02-7001-09-0	Breathing Hose-See *Section 5.4 or Section 5.5*
6	1	B6-02-5002-04-0	Center Section Lid Assembly-*See Section 5.6*
7	1	B6-02-5003-69-0	OrbSorb® CO_2 Scrubber Canister[2]
8	1	B6-02-5003-34-0	Scrubber Moisture Pad[3]
9	1	B6-02-5002-07-1	Center Section Assembly-*See Section 5.7*
10	1	---	Pneumatic Assembly-*See Section 5.9*
11	1	B6-01-5000-05-0	Alarm Monitor-*See Section 5.11*
12a	1	B6-02-5001-98-0	Green Oxygen Cylinder, Empty-*See Section 5.12*
12b	1	B6-02-5001-98-1	Green Oxygen Cylinder, Full-*See Section 5.12*
13	1	B6-02-5002-28-0	Lower Housing Assembly-*See Section 5.13*
14	1	B2-02-7001-24-0	Harness Assembly-Flame Rated
15	2	B6-02-5002-40-0	Ice Canister Freeze Form-*See Section 5.15*
16	1	B5-06-6000-22-0	User Manual-ENGLISH[3]
17	1	B5-06-6000-23-0	Benchman Manual-ENGLISH[3]
18a	opt.	B6-02-5002-63-0	Hard Transit Case (not depicted)
18b	opt.	B2-02-7000-39-0	Soft Transit Case (not depicted)
19a	1	B2-02-4001-50-0	AV3500 Storage Plug
19b	1	B2-02-4000-90-0	AV3000 Storage Plug
20a	1	B6-02-5002-54-0	Cylinder Fill Adapter, CGA 540 Male
20b	1	B6-02-5002-55-0	Cylinder Fill Adapter, CGA 540 Female
20c	1	B6-02-5002-53-0	Cylinder Fill Adapter, G ¾-A Male
20d	1	B6-02-5002-66-0	Cylinder Fill Adapter, fits Drager Booster Pump
21	1	B6-02-5002-41-0	Phase Change Heat Exchanger (PCM)
22	1	B2-02-7001-07-0	Moisture Absorbent Pad Set

Note:

1. The BioPak 240R respirator is supplied with a cardboard/foam shipping box. Hard or soft transit cases are to be ordered separately.
2. CO_2 Scrubber Canister, part number B6-02-5003-69-0, will supply four sets of canisters, four sets of moisture pads, and maintenance tags for four separate single uses.
3. Alternate language manuals are available. Contact Biomarine Representative for details.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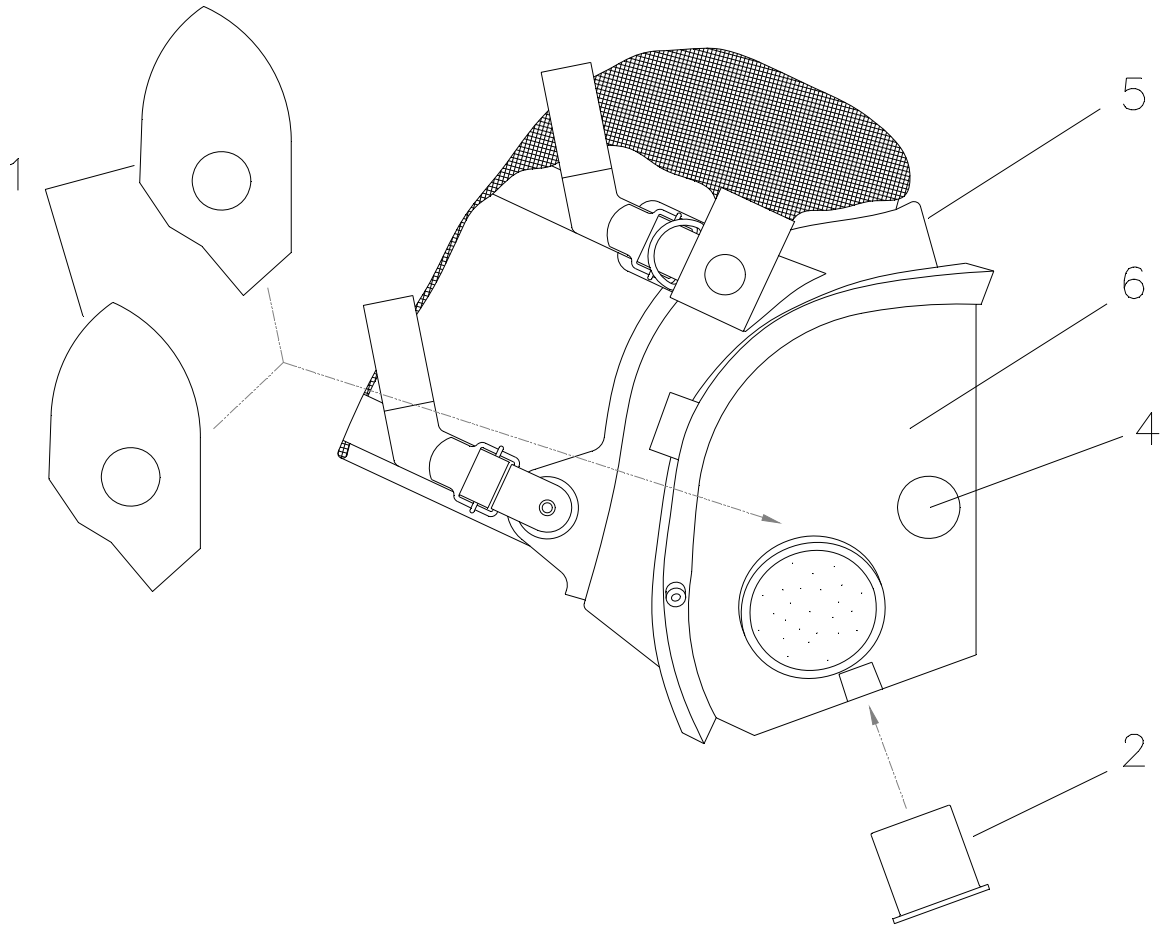
5.2 AV3000 Facemask Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5002-09-0	AV3000 Facemask-Small
REF	-	B6-02-5002-09-1	AV3000 Facemask-Medium
REF	-	B6-02-5002-09-2	AV3000 Facemask-Large
1	2	B2-02-7001-33-0	Nose Cup Pads[1]
2	1	B2-02-4001-26-0	Interface Tube
3	1	B2-06-6001-70-0	Storage Bag (not depicted)
4	opt.	B2-06-6002-31-0	Magnetic Lens Wiper
5	opt.	B6-02-5003-41-0	Replacement AV3000 Lens with Anti-Fog Film[2]
6	opt.	B2-06-6001-64-0	Kevlar Neck Strap
7	opt.	B6-02-5002-42-0	Spectacle Kit
8	opt.	B6-02-5003-44-0	AV3000 Field Test Kit
9	opt.	B6-02-5002-17-0	Anti-Fog Spray[3]

Note:

1. Nose Cup Pads, item 1, fit internal to the mask nose cup.
2. Contact factory for details concerning mask lens, item 5, replacement.
3. Anti-fog spray is not required for use of mask with anti-fog film but can be utilized to lubricate the optional magnetic wiper.

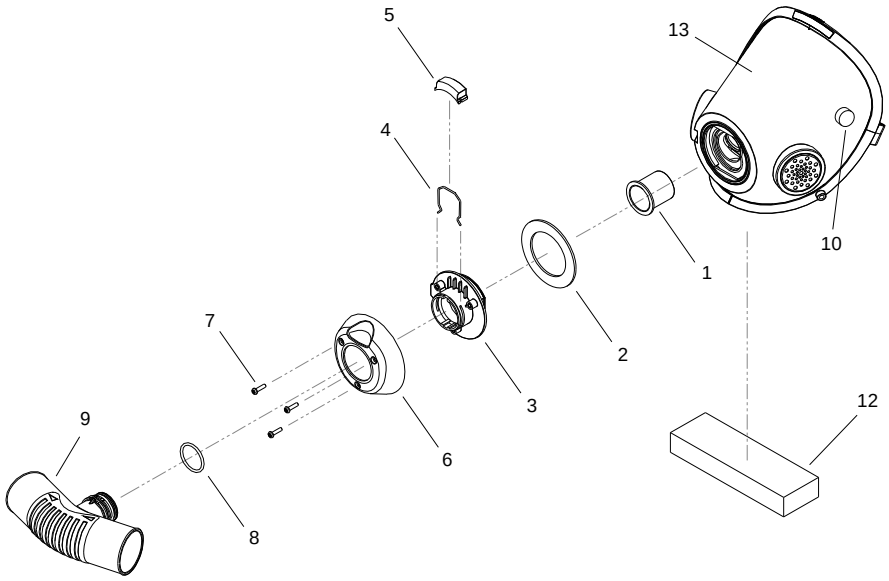


5.3 AV3500 Facemask Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5002-98-0	AV3500 Small Facemask-Complete[1]
REF	-	B6-02-5002-98-1	AV3500 Medium Facemask-Complete[1]
REF	-	B6-02-5002-98-2	AV3500 large Facemask-Complete[1]
1	1	B2-02-4001-26-0	Interface Tube
2	1	B2-06-6001-34-0	Interface Gasket
3	1	B6-02-5003-04-0	Interface Fitting[2]
4	1	B2-02-3300-68-0	Clip
5	1	B2-02-4001-54-0	Button
6	1	B2-02-4001-60-0	Cowling
7	3	B3-01-1061-07-1	Locking Pan Head Screw
8	1	B4-04-7060-25-0	Hose Adapter O-Ring[3]
9	1	B6-02-5003-01-0	AV3500 Hose Adapter[4]
10	1	B2-06-6002-31-0	Facemask Magnetic Wiper
11	1	B2-06-6001-70-0	Storage Bag (not depicted)
12	opt.	B2-02-7001-49-0	Chin Condensation Pad[5]
13	opt.	B6-02-5003-41-0	Replacement AV3500 Lens with Anti-Fog Film[6]
14	opt.	B2-06-6001-64-0	Kevlar Neck Strap
15	opt.	B6-02-5002-42-0	Spectacle Kit
16	opt.	B6-02-5003-43-0	AV3500 Field Test Kit
17	opt.	B6-02-5002-17-0	Anti-Fog Spray[7]

Note:

1. Complete facemask does not include adapter assembly defined by items 8 and 9.
2. Interface Fitting, item 3, includes fitting with gasket, item 2, installed.
3. Lubricate O-Ring, item 8, with Dow-111 prior to use.
4. Adapter Assembly, item 9, includes check valves holders, and check valve factory installed.
5. Chin Condensation Pad, item 12, will fit internal to the facemask underneath the nose cup in the lens chin area. The pad will absorb and retain moisture generated by the user in the facemask during use.
6. Contact factory for details concerning mask lens, item 13, replacement.
7. Anti-fog spray is not required for use of mask with anti-fog film but can be utilized to lubricate the optional magnetic wiper.

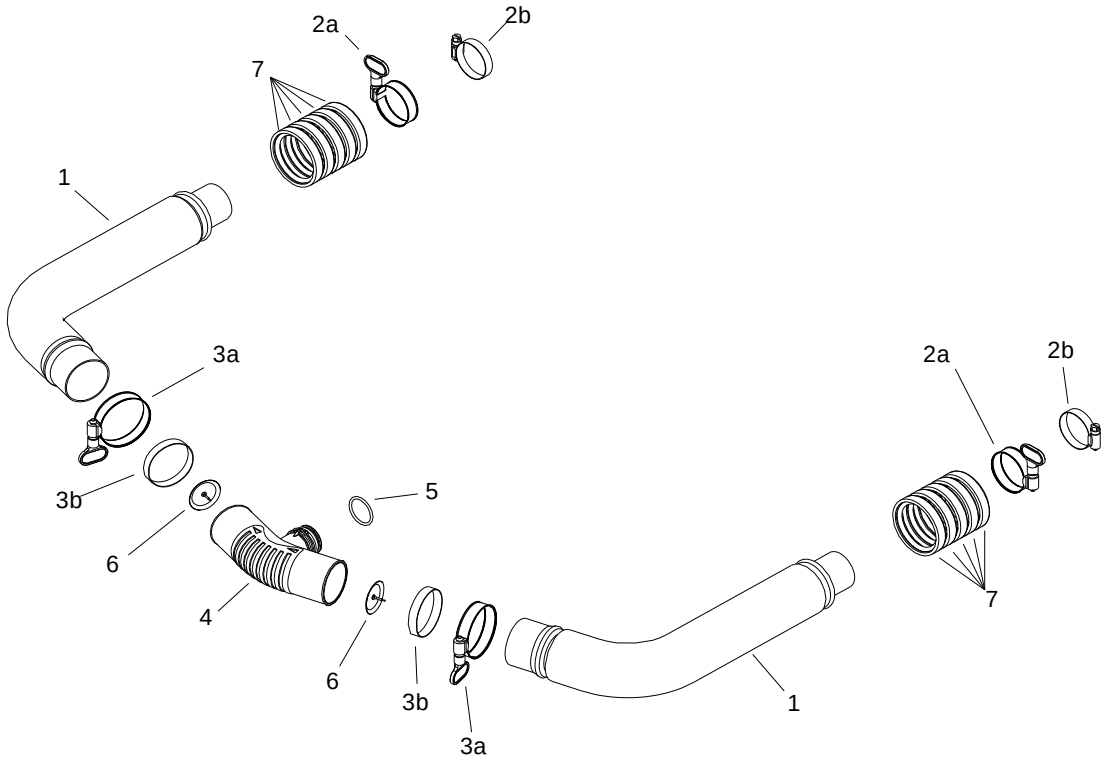


5.4 AV3500 Mask Breathing Hose

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5003-03-0	AV3500 Breathing Hose Set[1]
1	2	B2-02-7001-09-0	Breathing Hose
2a	2	B2-06-6002-19-0	Turn Key Clamp, 19-44mm
2b	opt.	B2-06-6000-01-0	Worm Gear Clamp (requires tool to operate)
3a	2	B2-06-6002-30-0	Turn Key Clamp, 32-57mm
3b	opt.	B2-06-6001-60-0	Stepless Ear Clamp (requires tool to operate)
4	1	B6-02-5003-01-0	AV3500 Mask Adapter Assembly[2]
5	1	B4-04-7060-25-0	Mask Adapter O-Ring[3]
6	2	B2-02-7001-11-0	Check Valves[4]
7	opt.	B2-02-4101-22-0	Anti-Crush Ring[5]

Note:

1. The Complete Breathing Hose Set includes all depicted items.
2. The Mask Adapter Assembly includes the check valves, item 6, and o-ring, item 5.
3. Lubricate the O-Ring with Dow 111 prior to use.
4. DO NOT lubricate the check valves.
5. Anti-Crush Rings, item 7, are optional components that will fit over the hose convolutions to prevent hose crushing.

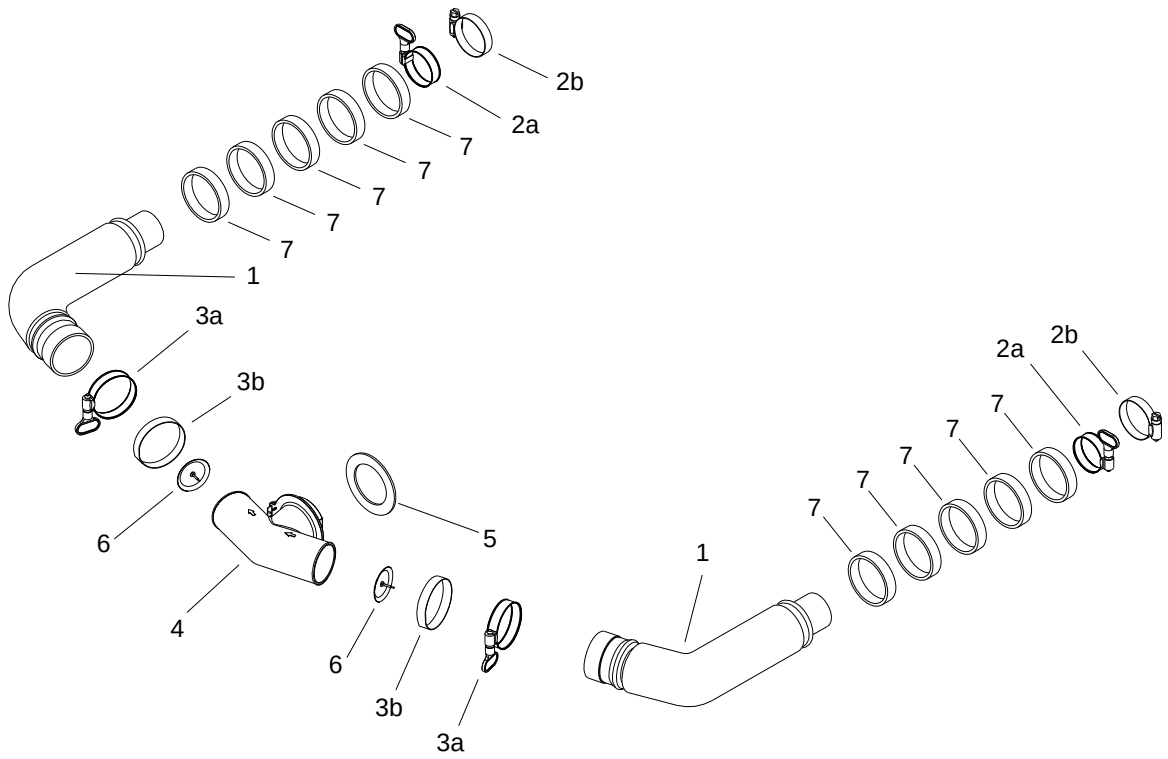


5.5 AV3000 Mask Breathing Hose

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-73-0	AV3000 Breathing Hose Set[1]
1	2	B2-02-7001-09-0	Breathing Hose
2a	2	B2-06-6002-19-0	Turn Key Clamp, 19-44mm
2b	opt.	B2-06-6000-01-0	Worm Gear Clamp (requires tool to operate)
3a	2	B2-06-6002-30-0	Turn Key Clamp, 32-57mm
3b	opt.	B2-06-6001-60-0	Stepless Ear Clamp (requires tool to operate)
4	1	B6-02-5002-25-0	AV3000 Mask Adapter Assembly[2]
5	1	B2-06-6001-34-0	Facemask Adapter Gasket
6	2	B2-02-7001-11-0	Check Valve[3]
7	opt.	B2-02-4101-22-0	Anti-Crush Ring[4]

Note:

1. The Complete Breathing Hose Set includes all depicted items.
2. The Mask Adapter Assembly, item 4, includes the check valves, item 6, and gasket, item 5.
3. DO NOT lubricate the check valves.
4. Anti-Crush Rings, item 7, are optional components that will fit over the hose convolutions to prevent hose crushing.



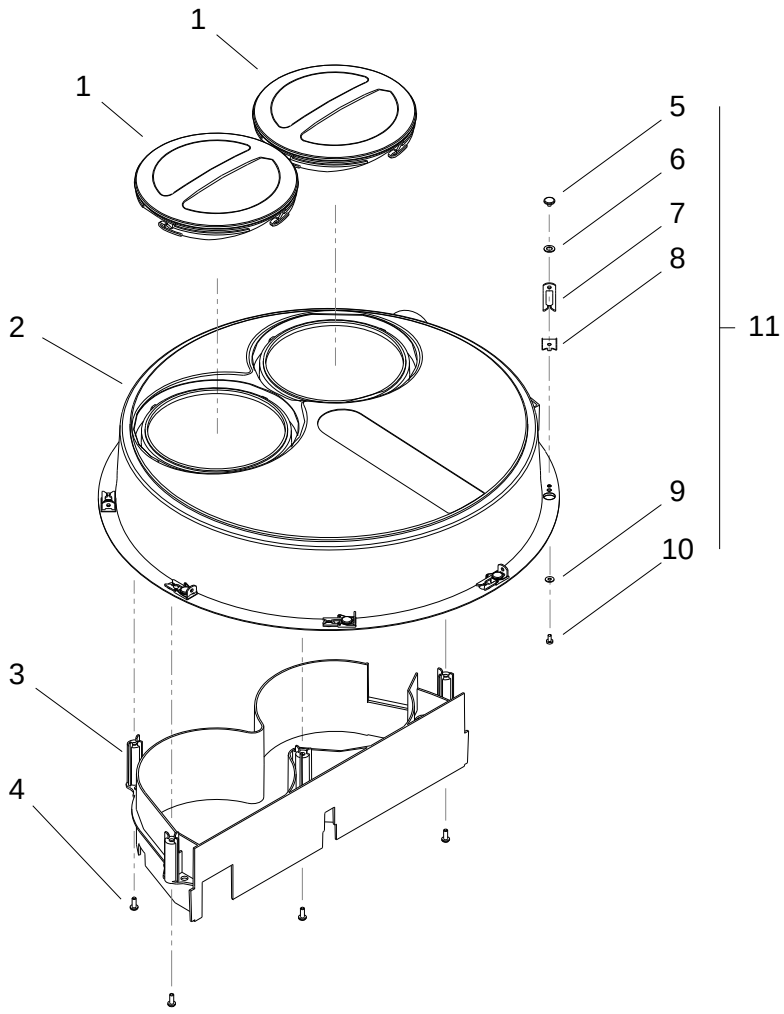
5.6 Center Section Lid Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-04-0	Center Section Lid Assembly-Complete
1	2	B2-02-4000-39-0	Coolant Lid
2	1	B6-02-5002-27-0	Center Section Lid[1]
3	1	B2-02-4000-72-1	Flow Baffle
4	4	B3-01-3064-00-1	#6 x 1/2" Self-Tapping Screws
5	8	B2-02-3100-17-0	Slide Fastener
6	8	B2-06-6000-06-0	Slide Top Washer
7	8	B2-06-6000-04-0	Slide Mechanism
8	8	B2-06-6000-05-0	Slide Guide Plate
9	8	B3-03-1023-01-0	Slide Bottom Washer
10	8	B3-01-1022-01-0	Slide Fastening Screw
11	8	B6-02-5002-92-0	Slide Kit[2]

Note:

1. Center Section Lid, item 2, is supplied with slide mechanisms installed, coolant shells installed, center section washers and instruction manual for installation. The baffle and coolant lids are not supplied.

2. Slide Kit, item 11, will supply one each of items 5 through 10.

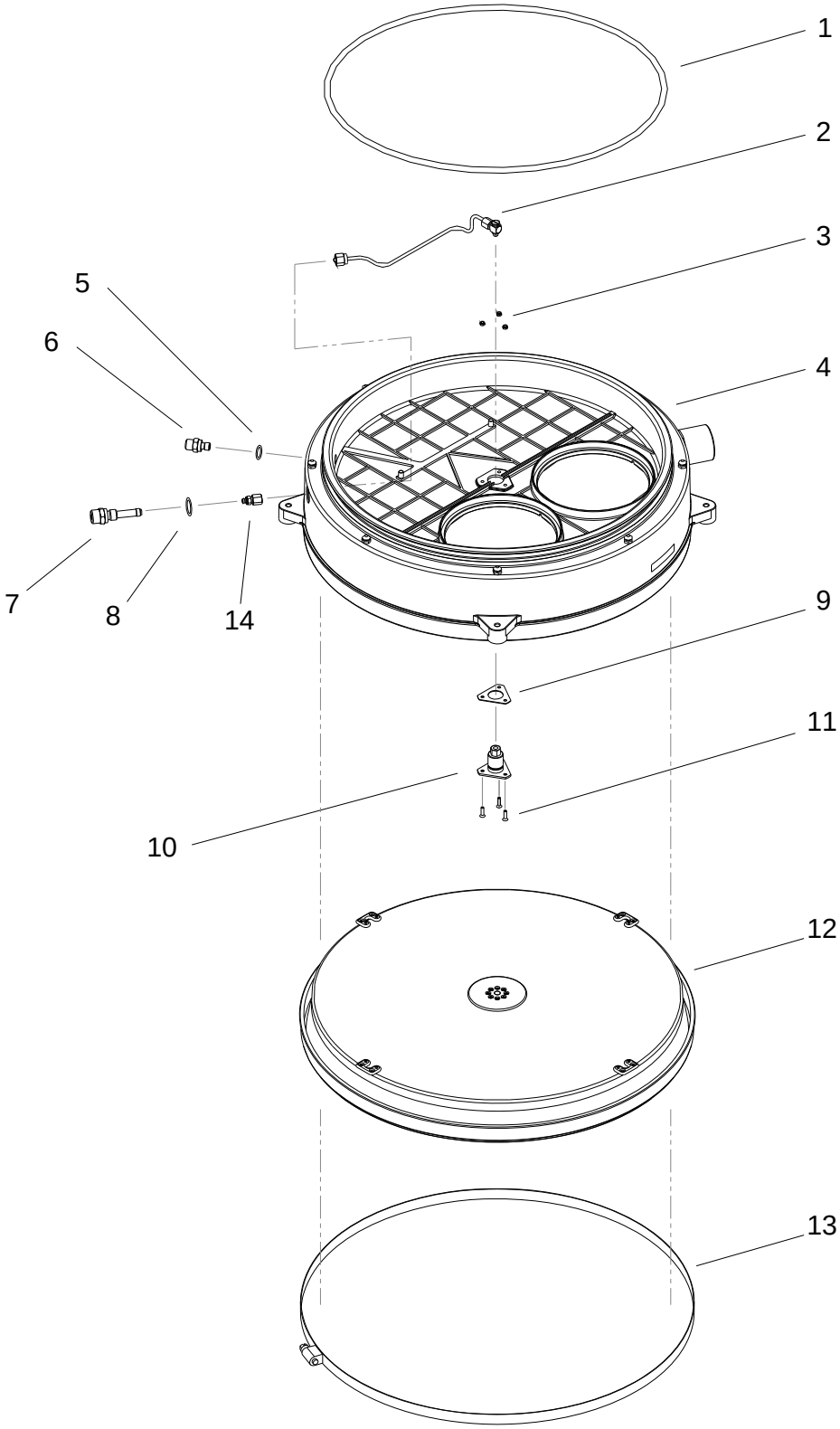


5.7 Center Section Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-07-1	Center Section Assembly-Complete
1	1	B4-04-7060-20-0	Lid O-Ring[1]
2	1	B6-02-5002-24-0	Demand Feed Tube
3	3	B3-02-0040-00-0	#4-40 Locking Hex Nut
4	1	B6-02-5002-71-1	Center Section Body Assembly[5]
5	1	B4-04-7070-03-1	Constant Add Fitting O-Ring[2]
6	1	B2-02-3300-06-0	Constant Add Fitting[3]
7	1	B2-02-3300-48-0	Demand Add Fitting[3]
8	1	B4-04-7060-01-1	Demand Add Fitting O-Ring[2]
9	1	B2-02-7001-10-0	Demand Valve Gasket[4]
10	1	B6-02-5002-23-0	Demand Valve Assembly
11	3	B3-01-0043-00-0	#4 x 3/8” Sealed Flat Head Screw[4]
12	1	B6-02-5002-05-0	Diaphragm Assembly, *See Section 5.8*
13	1	B2-06-6001-47-0	Diaphragm Clamp
14	1	B4-03-5204-08-0	#10 x 1/8” Tube Male Connector Fitting

Note:

1. Indicated components require lubrication with Dow-111 O-Ring Lubricant, B5-01-3000-11-0 prior to installation.
2. Indicated components require lubrication with Christo-Lube O-Ring Lubricant, B5-01-3000-01-0 prior to installation.
3. Install indicated components to a torque of 25-30 in-lbs.
4. Indicated components shall be installed with no lubricant.
5. Center Section Body Assembly, item 4, includes all depicted components with the exception of diaphragm, item 12, and diaphragm clamp, item 13.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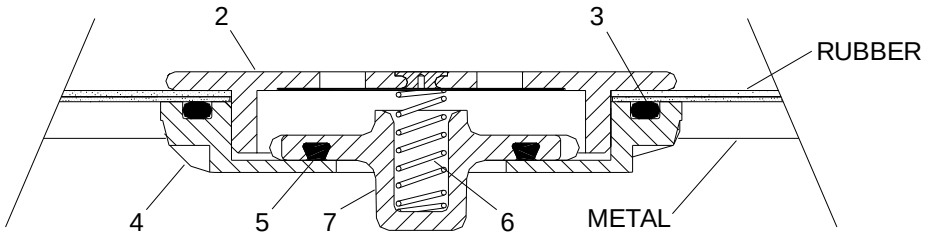
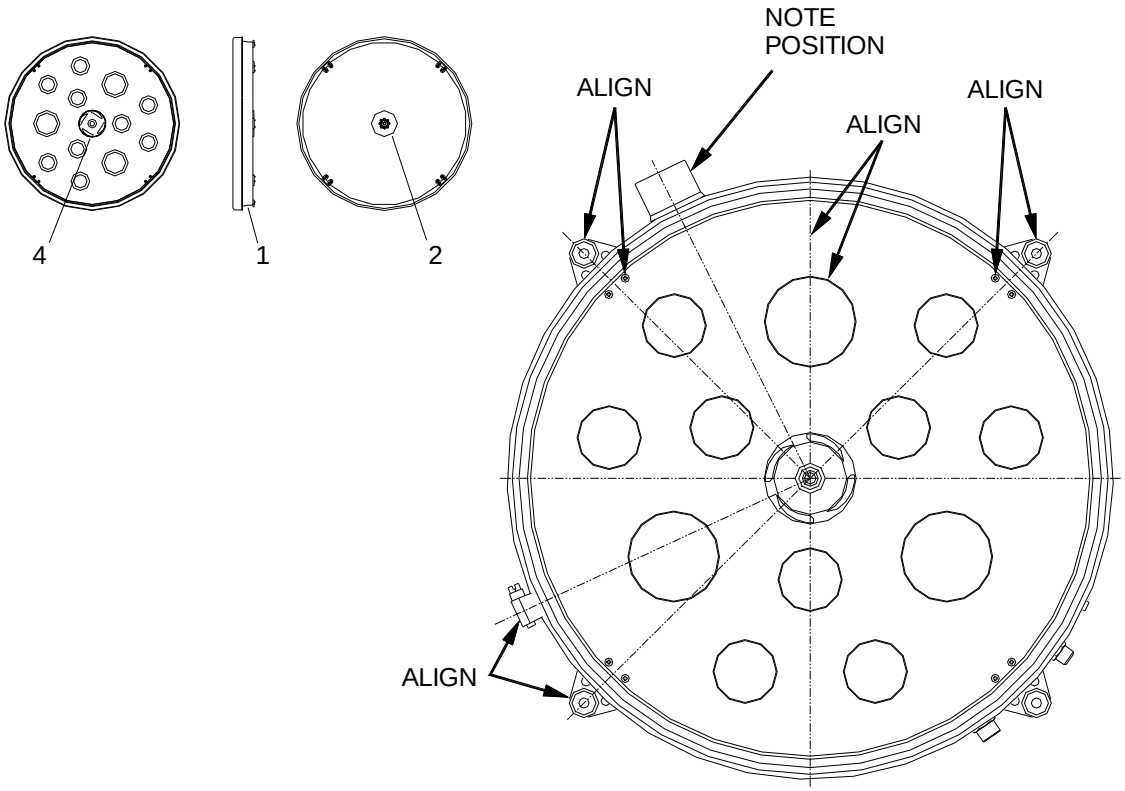
5.8 Diaphragm Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-05-0	Diaphragm Assembly-Complete
1	1	B6-02-5002-19-0	Flexible Diaphragm
2	1	B2-02-0000-08-0	Vent Cap
3	1	B4-04-7060-05-1	Vent Body O-Ring[1]
4	1	B2-02-4100-03-0	Vent Body[2]
5	1	B4-04-7060-04-1	Vent Seat O-Ring[1]
6	1	B2-06-6001-53-0	Vent Valve Spring
7	1	B2-02-4000-89-1	Vent Valve Seat

Note:

1. Indicated components shall be lubricated with Dow-111 O-Ring Lubricant, B5-01-3000-11-0, prior to installation.
2. Install Vent Body, item 4, hand tight.



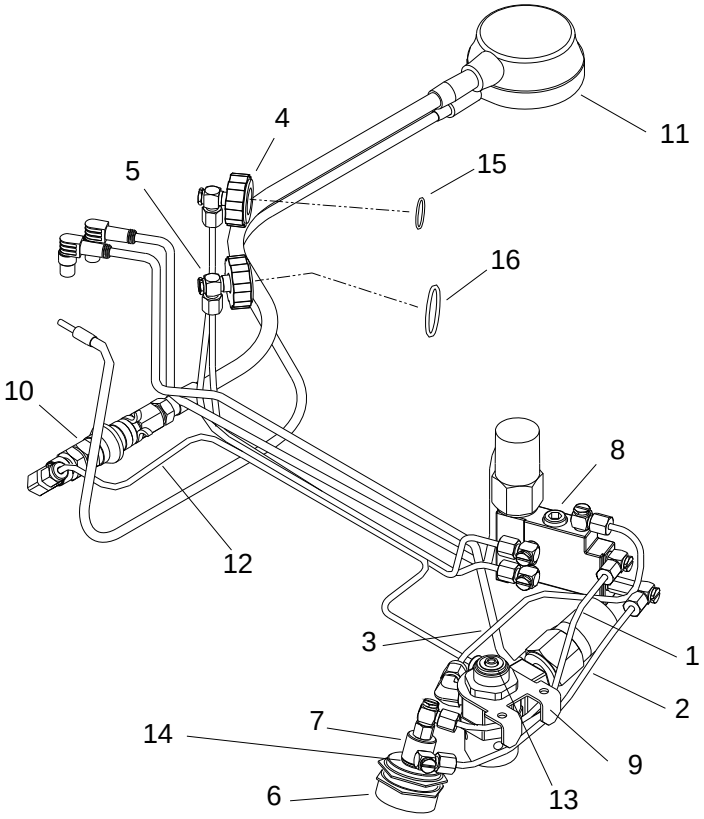


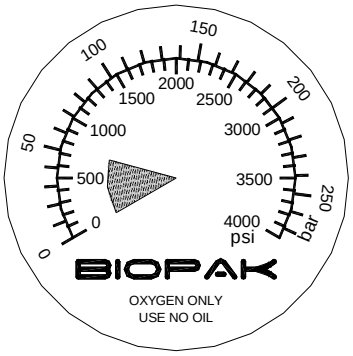
5.9 Pneumatic Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	---	Pneumatic Assembly
1	1	B6-02-5002-31-0	Bypass Feed Tube
2	1	B6-02-5002-32-0	Bypass Return Tube
3	1	B6-02-5002-30-0	Oxygen Feed Tube
4	1	B6-02-5002-03-1	Constant Add Center Section Feed Tube
5	1	B6-02-5002-02-1	Demand Add Center Section Feed Tube
6	1	B4-04-5000-00-0	Bypass Valve Push Button
7	1	B4-04-5570-00-0	Bypass Valve
8	1	B6-02-5002-00-0	Manifold Assembly, *See Section 5.10*
9	1	B6-02-5002-26-0	Oxygen Regulator Assembly[1]
10	1	B6-02-5002-43-0	Remote Gauge Shut Off Valve Assembly
11	1	B6-02-5002-45-0	Remote Gauge Assembly-psi/bar
12	1	B6-02-5002-44-0	Remote Gauge Feed Tube Assembly
13	1	B4-04-0030-00-0	Cylinder Seal Washer
14	1	B2-02-3300-14-0	Bypass Valve Spring[2]
15	1	B4-04-7070-02-1	Constant Add Tube O-Ring[3]
16	1	B4-04-7070-00-1	Demand Add Tube O-Ring[3]

Note:

1. Oxygen Regulator, Item 9, is supplied as a complete assembly only. Regulator will mount to BioPak lower housing with two #8 x 3/8" Self-Tapping Screws, B3-01-4071-00-0
2. Bypass valve spring, item 14, is to install between the bypass valve and the bypass valve push button. Spring shall seat around the actuator stem of the bypass valve.
3. Indicated components require lubrication with Christo-Lube O-Ring Lubricant, B5-01-3000-01-0, prior to installation.





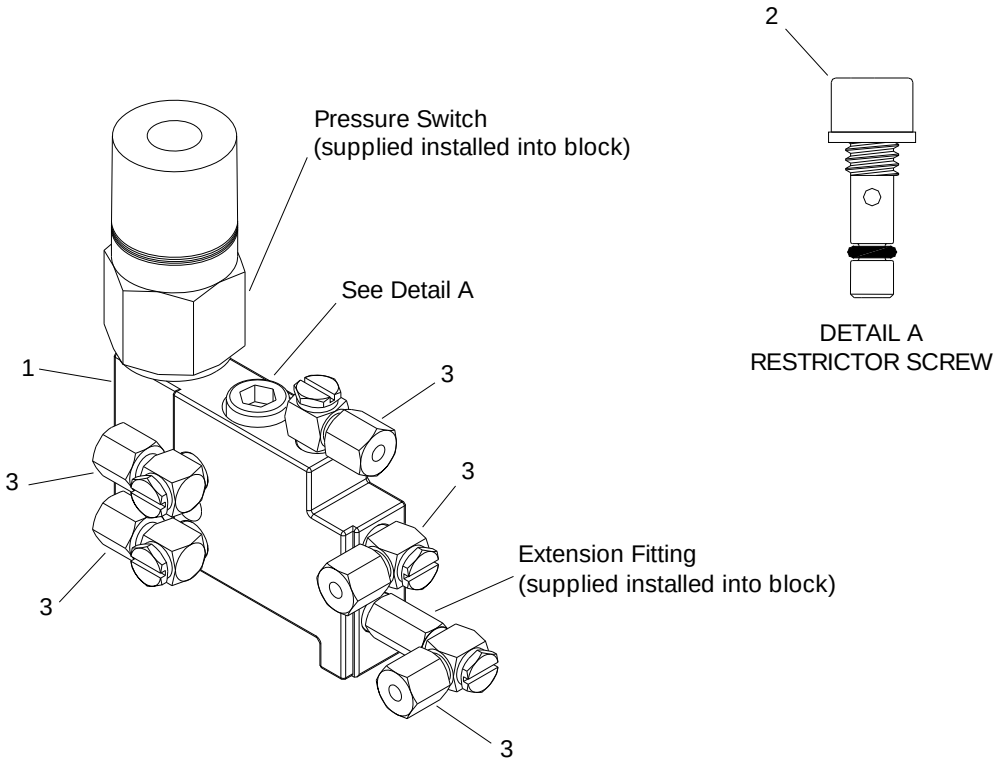
psi/bar Gauge Dial Face
Item 11a

5.10 Manifold Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-00-0	Manifold Assembly-Complete[2]
1	1	B6-02-5002-21-0	Manifold Block w/ Pressure Switch & Fittings
2	1	B6-02-5002-50-0	Flow Restrictor Assembly-Complete
3	5	B4-03-5203-01-0	Swivel Elbow Fitting[1]

Note:

1. Fittings, Item 3, are supplied on spare tube assemblies.
2. Manifold assembly mounts to lower housing of BioPak using two each of #6 x 3/8” screws, B3-01-1061-01-1, and tooth washers, B3-03-3063-00-0.



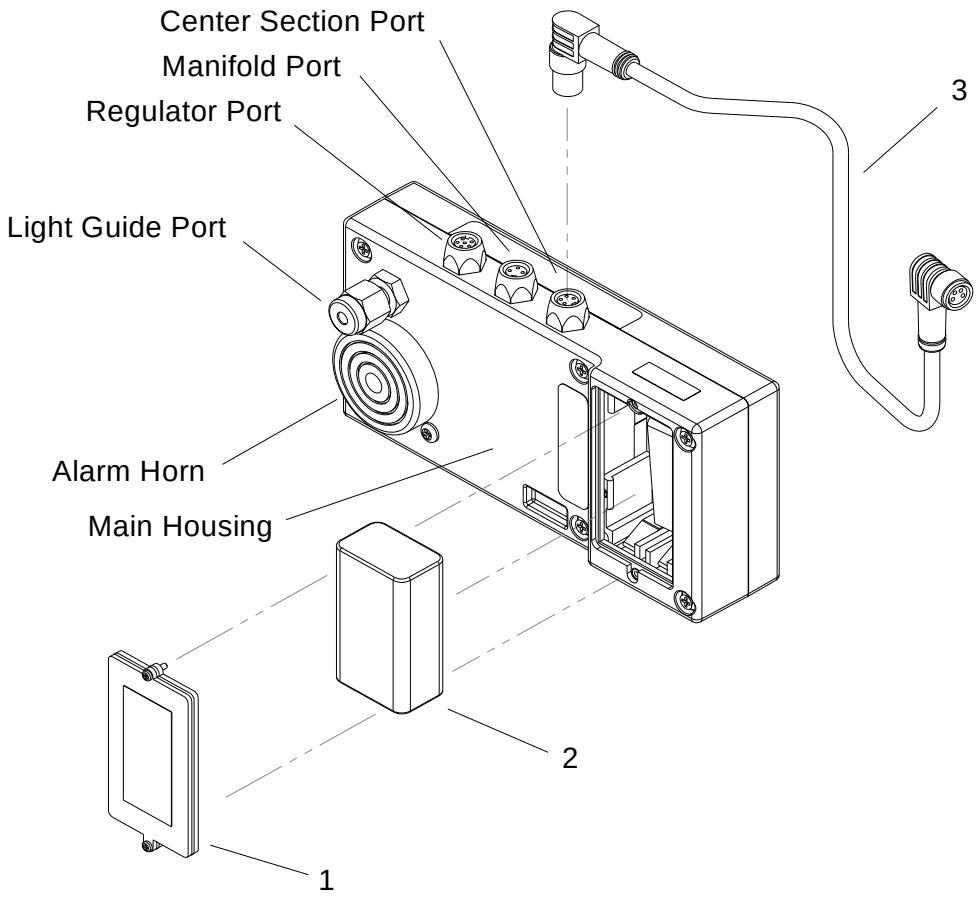
5.11 RMS Alarm Monitor

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-01-5000-05-0	Monitoring System Complete
1	1	B6-02-5002-51-0	Battery Door-Complete
2	1	B1-14-2000-00-0	9Vdc Battery[1]
3	1	B1-10-3000-03-0	Temperature Sensor Cable

Note:

1. Only the below listed battery types are suitable for use in the Monitoring System. Use of any other battery type will void intrinsic safety rating and certification.

   Energizer #522
   Panasonic #6AM6
   Rayovac #A1604
   Duracell #MN1604

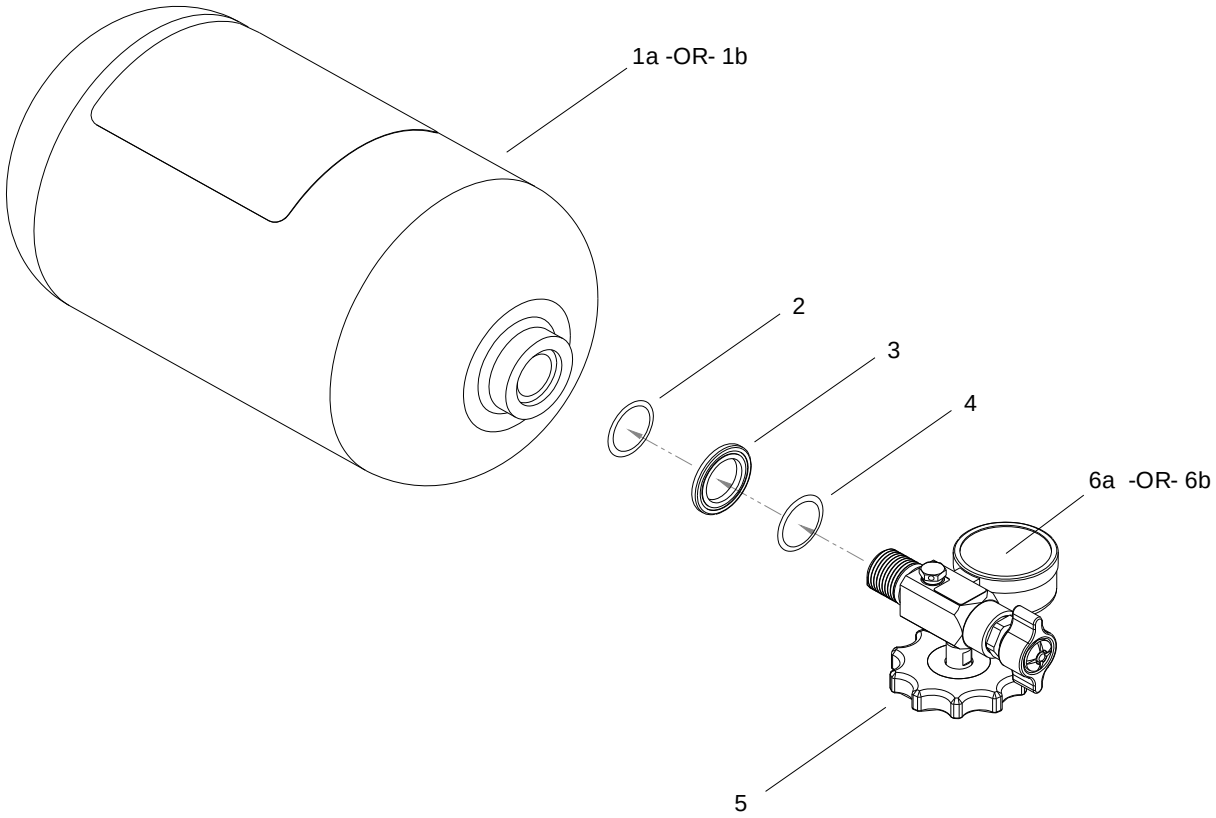


5.12 Oxygen Cylinder Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5001-98-0	Green Cylinder Assembly-Empty
REF	-	B6-02-5001-98-1	Green Cylinder Assembly-Filled[3]
REF	-	B6-02-5002-06-0	Black/White Cylinder Assembly-Empty
REF	-	B6-02-5002-06-1	Black/White Cylinder Assembly-Filled[3]
1a	1	B2-01-2000-06-0	Green Cylinder
1b	1	B2-01-2000-06-1	Black/White Cylinder
2	1	B4-04-7060-00-0	Exterior O-Ring[1]
3	1	B2-02-3300-52-1	Valve Collar[2]
4	1	B4-04-7060-07-2	Interior O-Ring[1]
5	1	B6-02-5001-97-0	Valve Assembly[2]
6a	1	B2-06-6001-38-0	Pressure Gauge Lens Cover-WIKA
6b	1	B2-06-6001-40-0	Pressure Gauge Lens Cover-Ametek

Note:

1. Indicated O-Rings, require lubrication with Christo-Lube Lubricant, B5-01-3000-01-0, prior to installation.
2. Valve Assembly, Item 5, includes valve plus components numbered Item 2 through Item 4. The Valve Assembly shall be installed into the cylinder at a torque of 60 +/- 1 foot-pound.
3. Filled cylinder assemblies can not be shipped from Biomarine to locations outside the borders of the United States of America.

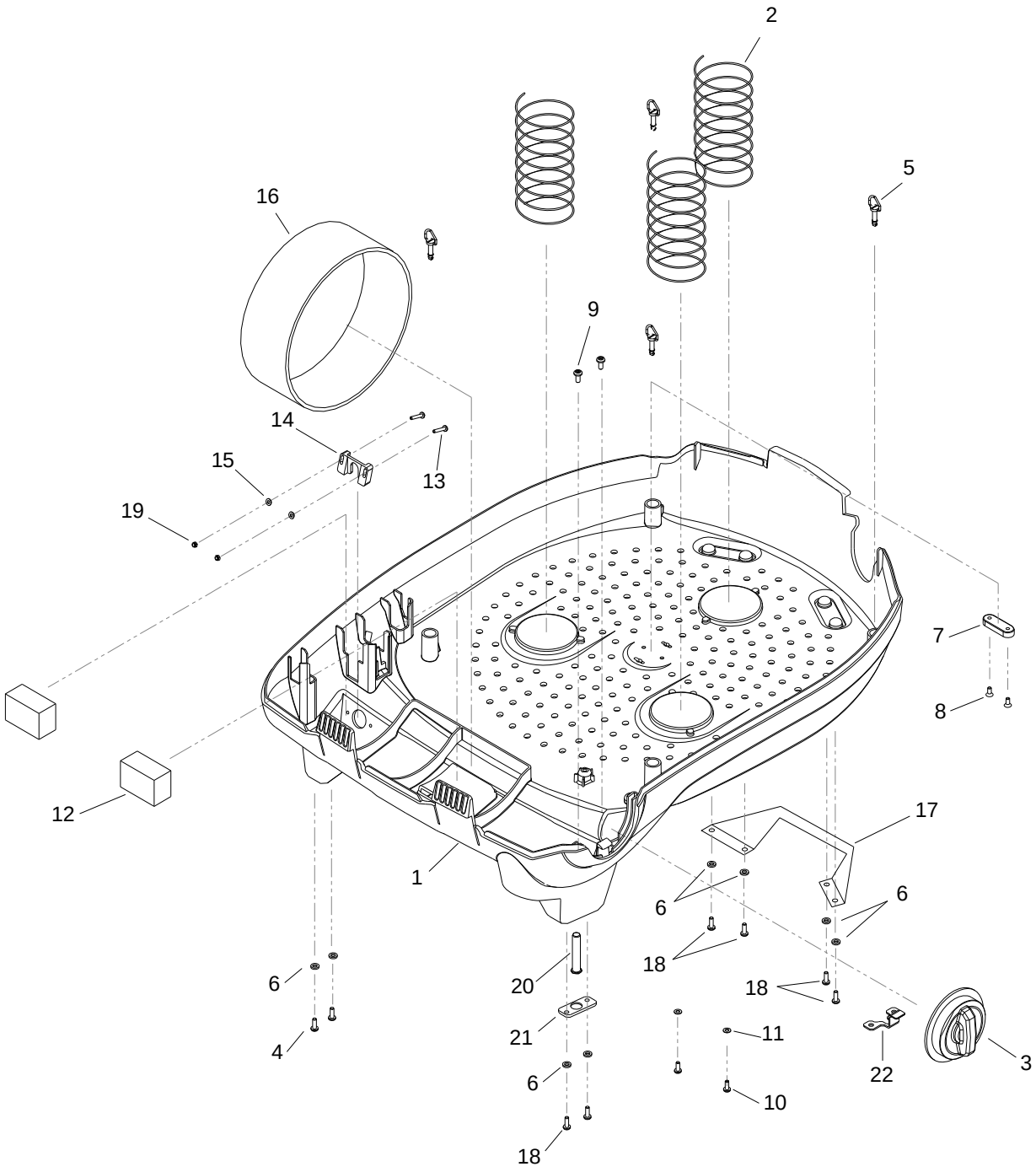


5.13 Lower Housing Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
1	1	B6-02-5002-28-0	Lower Housing Shell
2	3	B2-02-3300-46-0	Diaphragm Springs[1]
3	1	B2-02-4000-68-0	External Oxygen Knob[2]
4	2	B3-01-1071-03-0	Harness Waist Belt Fastening Screws[3]
5	4	B3-01-0008-00-0	¼-Turn Center Section Hold Down Pins
6	8	B3-03-1073-00-0	Harness Mounting Washers[3]
7	1	B2-02-1300-27-0	Vent Spacer
8	2	B3-01-1063-00-0	Vent Spacer Mounting Screw[3]
9	2	B3-01-4011-00-0	Oxygen Regulator Mounting Screw
10	2	B3-01-1061-01-1	Manifold Mounting Screw[3]
11	2	B3-03-3063-00-0	Manifold Mounting Washer[3]
12	2	B2-02-7001-30-0	Latch Foam Pad
13	2	B3-01-1042-00-0	Remote Gauge Mounting Screw[3]
14	1	B2-02-1100-10-0	Remote Gauge Mounting Bracket
15	2	B3-03-3043-00-0	Remote Gauge Tooth Washer
16	1	B2-02-7001-21-0	Oxygen Cylinder Hold-Down Strap[4]
17	1	B2-02-4001-29-1	Kevlar Carrying Handle[3]
18	6	B3-01-1071-01-0	Handle/Harness Shoulder Strap Mounting Screw[3]
19	2	B3-02-4040-00-0	Remote Gauge Hex Nut
20	1	B2-02-1300-29-0	Regulator Support Tube
21	1	B2-02-1300-05-0	Regulator Support Plate
22	1	B2-02-1100-11-0	Oxygen Knob Retaining Bracket

Note:

1. Diaphragm Springs, Item 2, install into lower housing by threading onto spring retainer projections.
2. External Oxygen Knob, Item 3, snaps into position within lower housing.
3. Indicated components are to be installed from the external side of the lower housing shell.
4. Oxygen Bottle Strap, item 16, is to be threaded through the lower housing shell slots for installation.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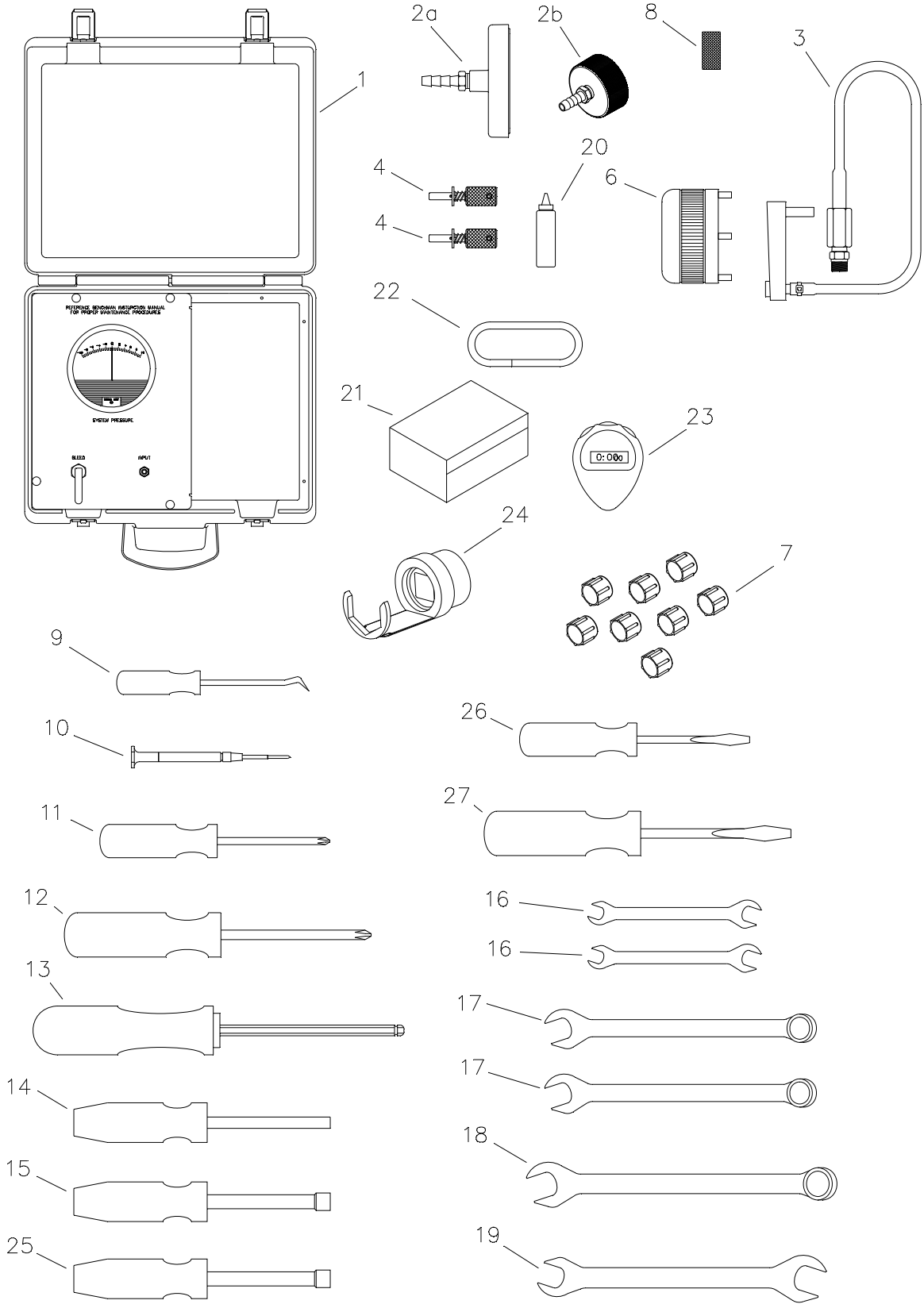
5.14 Service Kit Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	---	B6-02-5002-16-0	Service Kit-Complete
1	1	B6-02-5002-57-0	Replacement Case Assembly[1]
2a	1	B6-02-5002-56-0	AV3000 Leak Check Adapter Fitting
2b	1	B6-02-5003-00-0	AV3500 Leak Check Adapter Fitting
3	1	B6-02-5002-15-0	Flow Test Fixture
4	2	B6-02-5000-17-2	Test Key Tool
6	1	B2-03-3000-01-0	Vent Valve Hand Wrench
7	8	B2-06-6002-60-0	Demand Port Wash Plug
8	1	B2-02-5400-04-0	Regulator Wash Plug
9	1	B2-03-1000-10-0	Combination Pick Tool
10	1	B2-03-1000-15-0	#00 Phillips Head Screwdriver
11	1	B2-03-1000-03-0	#1 Phillips Head Screwdriver
12	1	B2-03-1000-16-0	#2 Phillips Head Screwdriver
13	1	B2-03-1000-17-0	¼” Hex Driver
14	1	B2-03-1000-09-0	3/16” Nut Driver
15	1	B2-03-1000-12-0	5/16” Nut Driver
16	2	B2-03-1000-04-0	3/8” x 5/16” Open End Wrench
17	2	B2-03-1000-06-0	7/16” Combination Wrench
18	1	B2-03-1000-13-0	½” Combination Wrench
19	1	B2-03-1000-05-0	5/8” x 9/16” Open End Wrench
20	1	B5-01-3000-03-0	Oxygen Safe Leak-Tec Leak Detection Fluid, 8 ounces
21	1	B2-02-7001-28-0	Tool Pouch
22	1	B4-02-6037-00-0	3/8” OD Rubber Tubing[2]
23	1	B2-03-1000-20-0	Stop Watch
24	opt.	B2-03-3000-08-0	Bypass Valve Tool[3]
25	1	B2-03-1000-21-0	9/32” Nut Driver
26	1	B2-03-1000-22-0	1/8” Slotted Screwdriver
27	1	B2-03-1000-01-0	3/16” Slotted Screwdriver

Note:

1. Replacement Case Assembly, item 1, includes the service kit case complete with internal pressure gauge and associated plumbing plus external shipping box.
2. Order a minimum length of 6-feet of tubing. Longer lengths are available upon request.
3. The Bypass Valve Tool, item 24, is not supplied with the Service Kit. The tool is utilized for installation and removal of the entire bypass valve assembly.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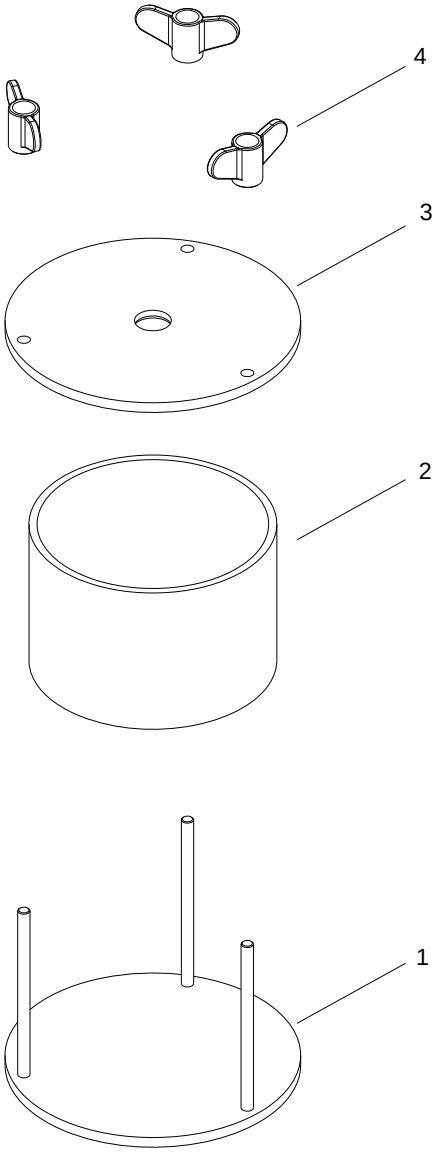
5.15 Coolant Canister Freeze Form

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	---	B6-02-5002-40-0	Ice Canister Freeze Form-Complete
1	1	B6-02-5002-58-0	Base Assembly
2	1	B2-02-4001-46-0	Freeze Tube
3	1	B2-02-1100-06-0	Top Plate
4	3	B3-02-4100-00-0	Wing Nut



5.16 Miscellaneous Supplies

DESCRIPTION	PART NUMBER
Seal and Lubrication Kit	B6-02-5002-14-0
Seal Kit (includes all replacement seals without lubricants)	B6-02-5002-14-1
Christo-Lube O-Ring Lubricant (2-ounce tube)	B5-01-3000-01-0
Dow-111 O-Ring Lubricant (5.3-ounce tube)	B5-01-3000-11-0
Oxygen Safe Leak-Tec Leak Detection Fluid (8-ounce bottle)	B5-01-3000-03-0
Disinfectant Maintenance Tag	B5-06-6000-17-0

5.17 Optional Attachments

***Breathing Hose Protective Sleeve, B2*-02-7001-22-0**: A Kevlar sleeve that will slide over the exterior of the breathing hose to provide abrasion protection.

Hard Transit Case, B6-02-5002-63-0: An injection molded-style carrying/storage case that provides exceptional BioPak 240R storage capabilities.

Soft Transit Case, B2-02-7000-39-0: An armored cloth-style carrying/storage case that provides a shoulder strap. Soft case is smaller and lighter than hard case but will not provide the same protection or storage space as the standard hard case.

***Hydration System, B6-02-5002-52-0*:** The Hydration System provides a 1.5-liter reservoir and an interface to the AV3000 or AV3500 facemask that will enable the user to drink liquid without breaking the breathing loop seal to the external ambient atmosphere.

Drier Manifold, B6-02-5002-87-0: The Drier Manifold will provide a connection of up to six BioPaks to a single line for connection to a user-supplier blower for drying.

Harness Shoulder Pad, B2-02-7001-48-0: Constructed of flame-rated materials, will provide additional padding on the shoulder of the main harness.

High Pressure Digital Leak Tester, B6-02-5003-39-0: Provides a method to test the high-pressure sections of the BioPak (from cylinder valve to remote gauge and to demand housing and all connection in between) utilizing pressure decay and eliminating the use of leak detection fluid. Leak detection will be required if a leak is detected in order to locate the leak but leak detection fluid is not required for initial testing.

6. APPARATUS SPECIFICTIONS

Respirator Type:	Self-Contained, Closed-Circuit, Pressure-Demand
Respirator Duration:	Certified as entry and escape, 4-hour duration
Size:	23.0 x 17.3 x 7.0 inches (584 x 439 x 178 mm)
Weight (Fully Charged):	34 pounds (15.4 kg)
Operational Conditions[1]:	Temperature: -5°F to 104°F (-20°C to 40°C) Relative Humidity: 0 to 100%
Storage Conditions:	Temperature: 40° to 90°F (4°C to 32°C) Relative Humidity: 30 to 100%
Oxygen Delivery:	Constant Add: 1.8 lpm Average Demand Add: 80 lpm Minimum Emergency Add: 80 lpm Minimum
Oxygen Supply:	> 99.5% Oxygen by volume < 300 ppm Carbon Dioxide < 10 ppm Carbon Monoxide 50 mg/m^3 Water Content Maximum Tasteless and Odorless 440 liter storage at 300 psig (207 bar) pressure
Battery:	Power: 9 Vdc Life: 200-hours or six months Type: Only the below types may be used Energizer 522 Panasonic 6AM6 Rayovac A1604 Duracell MN1604
Carbon Dioxide Scrubber:	Dual, single use “Solid-Core” canisters Non-dusting Non-settling Non-channeling
Tidal Volume:	> 6.0 liters
Apparatus Approval:	NIOSH #TC-13F-541 (AV3000 Mask) NIOSH #TC-13F-684 (AV3500 Mask)
Monitor Approval:	MSHA 18-A060028-0
Cylinder Approval:	US DOT-E11194 per DOT-CFFC Standards Transport Canada TC-SU 5303
Expected Battery Life:	At ambient temperature above 40°F (4°C), 200 hours or 6-months

Note:

1. Operating temperature range provided above is the standard 4-hour duration with PCM installed. For extreme temperature ranges, the BioPak should be configured with ice coolers and utilized as directed below:

Ambient Temperature	**Recommended Safe Duration of Use**
105 to 140°F 41 to 60°C	1-hour
141 to 194°F 61 to 90°C	15-minutes
+194°F +90°C	6-minutes

The above temperature/duration figures are derived from human endurance limits and not from the endurance limit of the BioPak.

7. MAINTENANCE LOG SHEET

BioPak Model: BioPak 240R

BioPak Serial Number:

Date	Turnaround Maintenance	Long Term Maintenance									Comments, Benchman Signature
		Visual Inspection	Demand Valve Test	Constant Flow Test	Vent Valve Test	Low Pressure Leak Test	High Pressure Leak Test	Bypass Valve Test	Alarm Test	Maintenance Tag Validation	

8. WARRANTY

Biomarine warrants, subject to the terms below, that the goods will be free from defects in design, materials, and workmanship for a period of three (3) years from the date that the goods are purchased by buyer. THIS WARRANTY DOES NOT APPLY TO OXYGEN CYLINDER HYDROSTATIC TESTING FOR PERIODIC RECERTIFICATION OF THE PRESSURE VESSEL OR CONSUMABLES.

THE SOLE LIABILITY OF BIOMARINE FOR ALL PURPOSES SHALL BE TO REPLACE OR REPAIR, AT THE SOLE OPTION OF BIOMARINE, DEFECTIVE PARTS APPEARING WITHIN THE THREE (3)-YEAR PERIOD AS APPLICABLE. BIOMARINE SHALL PROVIDE PARTS AT ITS OWN EXPENSE BUT ALL LABOR SHALL BE AT THE EXPENSE OF THE BUYER. BIOMARINE SHALL HAVE NO OBLIGATION FOR REPLACEMENT UNLESS:

1. BIOMARINE HAS RECEIVED WRITTEN NOTICE OF THE ALLEGED DEFECT WITHIN THIRTY (30) DAYS FOLLOWING THE DISCOVERY OF THE DEFECT OR THIRTY-SEVEN (37) MONTHS FROM THE DATE OF PURCHASE, WHICHEVER OCCURS SOONER; AND
2. THE BUYER SUBMITS PROOF OF DATE OF PURCHASE WITH INVOICE OR EQUIVALENT DOCUMENTATION; AND
3. THE DEFECTIVE GOODS ARE PROMPTLY RETURNED BY BUYER, AT THEIR SOLE EXPENSE TO BIOMARINE AT: 456 CREAMERY WAY, EXTON, PA 19341 USA; AND
4. THE EQUIPMENT HAS NOT BEEN ALTERED; AND
5. THE EQUIPMENT IS OPERATED AND MAINTAINED IN ACCORDANCE WITH ALL INSTRUCTIONS AND MANUALS PROVIDED TO THE BUYER.

It shall be the responsibility of the buyer to read carefully and abide by all instructions provided to the buyer in the instruction manual or elsewhere. If buyer, and the employees of the buyer, did not abide by such instructions, then the alleged defect shall not be deemed to have arisen under circumstances of proper use. The instructions for use of the goods reflect the opinion of experts based on field use and tests. The instructions should be followed carefully. It is impossible, however, to eliminate all risks inherently associated with the use of the goods. Unintended consequences may result because of factors as weather conditions, the presence of other materials, or the use or manner of application of the goods, all of which are beyond the control of Biomarine. The buyer shall assume all such risks.

Buyer shall be responsible for insuring that the goods are functioning properly at all times and shall not use any goods, which are not functioning properly. If buyer uses goods when they are not functioning properly, then buyer agrees to defend, indemnify and hold Biomarine harmless against all losses, damages, and injuries to persons or property as a result of the use of the malfunctioning goods.

These warranties do not extend to the goods if they have been subjected to misuse, neglect, or accident, including extended exposure to direct flames and/or caustic chemical products, after its delivery to buyer, nor does it extend to any item that was modified or altered after its delivery to buyer.

IN NO EVENT WILL BIOMARINE BE LIABLE FOR ANY LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE DEFECTS OR FROM THE USE OF THE GOODS OR FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE, OR FOR PERSONAL INJURY OR PROPERTY DAMAGE OR ANY FINANCIAL LOSS.

Any description of the goods contained in any documents to which these warranty provisions related, including any quotations or purchase orders relating to the goods being delivered to buyer, are for the sole purpose of identifying the goods, and any such description, as well as any sample or model which may have been displayed to or seen by buyer at any time, have not been made part of the basis of the bargain and have not created or amounted to any warranty, express or implied, that the goods would conform to any such description or any such sample or model.

EXCEPT AS SPECIFICALLY SET FORTH IN THESE WARRANTIES, BIOMARINE MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WHETHER ARISING BYLAW, CUSTOM, CONDUCT OR USAGE OF TRADE, INCLUDING WARRANTIES AS TO MERCHANTABILITY, OR AS TO THE FITNESS OF THE GOODS FOR ANY PARTICULAR USE OR PURPOSE, AND ANY WARRANTIES INCLUDING WARRANTIES AS TO MERCHANTABILITY AND FITNESS FOR PARTICULAR USE OR PURPOSE AND THE RIGHTS AND REMEDIES PROVIDED HEREIN ARE EXCLUSIVE. THESE WARRANTIES SHALL RUN TO THE BUYER ONLY AND SHALL NOT BE CONSTRUED AS A CONDITION.

Biomarine does not warrant that the goods are free from the rightful claim of any third person by way of infringement or patents or other proprietary information or disclaims any warranty against such infringement.

The terms of these warranties shall apply to the product sold by Biomarine, except absorbent, filters, batteries and anti-fog lens inserts which are considered “consumable items”, and as such are not covered by the terms of these warranties. No waiver, alteration, or modification of the terms of these provisions shall be valid unless in writing and signed by an executive officer of Biomarine.

These warranties shall not apply to accessories or devices purchased by Biomarine and attached to or made part of the goods except that Biomarine warrants the (I) the installation of such items in the completed product shall so conform to the installation instructions of the manufacturers thereof as not to invalidate such applicable warranties on such items as are obtained by Biomarine from such manufacturers, and (ii) the workmanship incorporated in such installation shall be free from defects.

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